American Artisan

Founded 1880

The Warm Air Heating and Sheet Metal Journal

Vol. 97, No. 22 CHICAGO, JUNE 1, 1929 $2.00 Per Year

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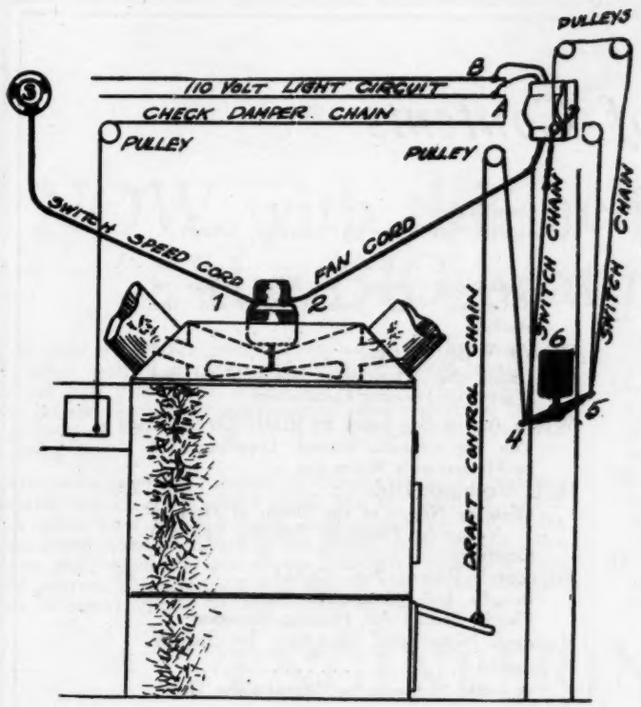
YES---you can give your customers automatically controlled fan operation with the---

ROBINSON
Heat Distributor

—and the volume of forced air is controlled—

—by a Three-Speed Switch located in the living quarters



Automatic control circuit for the ROBINSON Heat Distributor

THIS shows the method of connecting to furnaces equipped with automatic damper, or gas regulator control. The control (6) is usually mounted and connected with chain and pulleys to either gas valve or draft door and check damper. The control box contains magnetic or motor power which actuates the cross arm (4-5) and is governed by a thermostat located in the house proper.

To connect the distributor so that forced air circulation is automatically in effect whenever the draft is open obtain a Square D catalog No. 97211 switch or equivalent. This is mounted above the draft control so that a downward pull on the switch handle will close the contacts and an upward pull will open them. This pull is given by connecting the ends of the draft control lever (4-5) to the switch handle with chain and pulley combinations such as lead to the draft and check damper.

Two lengths of insulated No. 14 wire A and B are brought from the nearest 110 volt light line and connected to the upper terminals of the switch. The plug is removed from the 2 conductor fan cord (2) and the two wires connected to the bottom terminals of the switch.

With the Robinson Heat Distributor connected in this way forced air circulation will automatically start whenever the furnace is fired and volume of forced air can be controlled from 3 speed switch (s) located in house proper. Switch S should not be left in "Off" position.

This is taken from another installation cooperation sheet sent to warm air heating contractors selling the Robinson Heat Distributor.

Write for this sheet which also shows how to connect for Oil Burner installations.

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Say you saw it in AMERICAN ARTISAN—Thank you!

Entered as second class matter, March 26, 1928, at the Post Office at Chicago, Ill., under act of March 3, 1879. Formerly entered on June 25, 1887, as American Artisan and Hardware Record.

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The Warm Air Heating and Sheet Metal Journal

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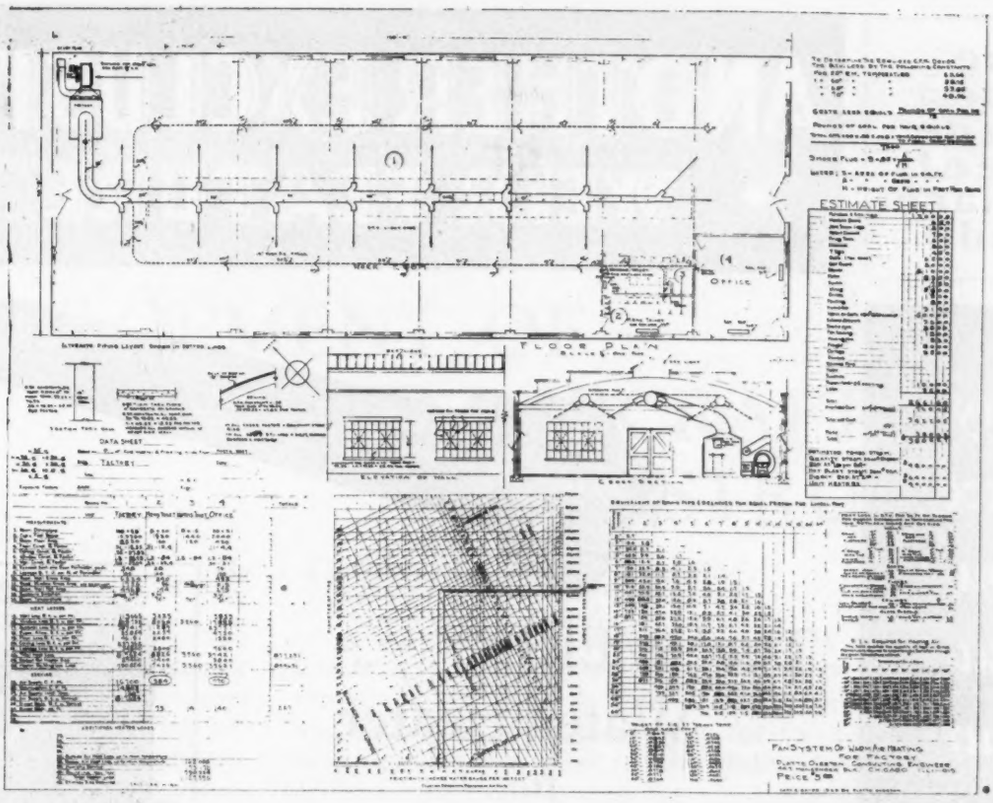
In NEXT WEEK'S Issue!

Complete Report NATIONAL SHEET METAL CONVENTION

AMERICAN ARTISAN will have representatives and reporters covering the National Sheet Metal Convention at Baltimore—June 3 to 7—the story will appear *immediately following the convention*—read it—in our June 8th issue.



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DEVELOPMENT OF WELDED AIRCRAFT CONSTRUCTION

By S. C. CLARK[1] and W. I. GASTON[2]

In this paper presented by the authors at the Third National Meeting of A. S. M. E., Aeronautic Division, St. Louis, May 27, they point out that steel tubing is coming into common use for fuselage construction and with this, there is a trend toward general use of welding. It is desirable to establish standard designs for welded joints and to this end further research is needed. Suggestions are made for improvements in welding practice that will add safety and insure uniformly well-made welds.

IN THE EARLY days of aviation it was natural that the pioneer experimenters should turn to wood as a structural material for airplanes. It was about the only suitable material available. Seamless-steel tubing was not unknown but it is doubtful if it could be had in the extremely thin-walled variety having the physical properties necessary to produce a very strong, light structure. High-strength alloys of aluminum were not developed until after the World War. Even if suitable steel had been available commercially, a convenient method of fabrication would have been lacking, for, at the time of the first memorable experiments of the Wright Brothers, gas welding was in about the same stage of commercial development as aviation. It is interesting to note that the development of the process is somewhat coincidental with that of aviation, having had its inception at about the same time and having received its greatest impetus during the World War. These are all pertinent facts.

Airplane structures were, therefore, first constructed of wood. But, although wood still has its adherents, notably in foreign countries, many engineers soon began to see its shortcomings as a material for fuselage construction. In the first place wood, being a natural material, does not have the same uniformity of physical properties as metals, which are manufactured. Also, it must be remembered that a wooden fuselage is necessarily a composite structure requiring metal fittings at the joints and piercing of the wooden members, with consequent weakening of the section. It is very difficult to make such a structure function as a unit when stressed, rather than have individual members bear the brunt of the load at the point of application. Considerations of safety also favor metal construction since metal will bend while wood has a tendency to splinter, leaving sharp ends. Small cracks are much more likely to exist undetected in a wooden structure than in one of metal.

However, the choice of a material for a given airplane part is largely a matter of proportion. For a part as deep as a fuselage, most of whose members function either as long columns or as tension members, according to the conditions of flight, metal is thought by the majority of engineers to produce the most economical section, considering the strength-weight ratio. On the other hand, for wings, which are of less depth and under flexural stress at all times, many feel that wood, even allowing an extra factor of safety for its lack of uniformity, produces the most economical section for wings of small or moderate size. As wing sections become deeper, metal construction becomes relatively more economical and therefore metal is being adopted rapidly for wing construction in the case of large planes. The present trend seems to be toward composite metal construction for wing structures, although some large wing structures have been fabricated entirely of welded chrome-molybdenum steel tubing. Welded steel wing beams, or spars, are being used with ribs of aluminum alloy.

For fuselage construction, mild-

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[1] Resident engineer, The Linde Air Products Company, Kansas City, Mo.

[2] Oxweld Acetylene Company, New York, N. Y.

Note.—Statements and opinions advanced in papers are to be understood as individual expressions of their authors and not those of the Society.

Figure 1.—Condition of Welded Joints After a Bad Crash.

steel or alloy-steel tubing with welded joints is general practice. The most complicated joints or fittings can be fabricated easily from light-weight steel sheet and tubing by welding, and finished fittings can be heat-treated if desired. Dies and patterns are not required, as would be the case if forged or cast fittings were used. This is especially important because of the rapidity with which airplane models change.

All forms of riveted or bolted construction will, sooner or later, loosen up to some extent at the joints. A welded fuselage is rigid and cannot develop play at the joints. Mechanical deterioration in joints is eliminated by this type of construction. A welded fuselage, if damaged, can be repaired easily, in any location, to be just as strong as it was originally.

Present Status of Aircraft Welding

A welded-steel fuselage can be built, maintained and repaired economically. These conditions, in addition to the fact that the majority of American aeronautical designers believe that the most economical strength-weight ratio is obtained through this construction, have made welded steel tube fuselages common in this country. About 90 per cent of American-made ships are being so constructed at the present time. Even when fuselages are constructed from duralumin, the highly-stressed landing gear, tail skid and motor mount are fabricated from chrome-molybdenum steel by welding and are then heat-treated.

The ability of welded-steel fuselages to stand the severe stresses of sustained flight with heavy loads has been amply demonstrated. All of the American planes that successfully completed trans-Atlantic and

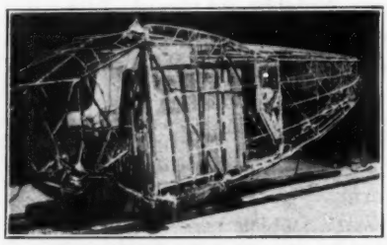


Figure 2.—Tangled Mass in Pilot Seat. There Were No Failures at Joints.

Hawaiian flights were equipped with welded-steel tubing fuselages.

Many pilots owe their lives to these crash-proof fuselages. When "crack-ups" occur the tubes bend and buckle, but the welds hold, keeping the structure largely intact. Welded aluminum gasoline tanks, which will often stand enormous impacts without even springing a leak, have also been a valuable contribution to the cause of safety. These are common equipment on the airplane of today. Fig. 1 shows the condition of a welded joint after a bad crack-up. The tubing is bent but the welds all held. Fig. 2 shows two 150-gallon gasoline tanks that survived the same crash without springing a leak.

F. F. Sisco, Chief of the Metallurgical Laboratory, Air Corps, Wright Field, Dayton, Ohio, said in a paper presented at the tenth annual convention of the American Society for Steel Treating at Philadelphia:

"The art of welding, especially of thin tubular products, has progressed to the point where it is practically 100 per cent perfect. The perfection attained is so high that at present the welded fuselage is standard in airplane construction. Other applications of welding in airplane and engine construction are too numerous and too well known to demand further consideration. Failures due to improper welding in the construction of the airplane are exceedingly rare; when they do occur they are almost always due to the welder and seldom if ever have their origin in the materials or the process."

Some of the best fetaures of gas-welding practice have been successfully adapted to aircraft manufacture from other industries. For example, joints made by inserting a reinforcing plate in the plane of the axes of two or more tubes (in saw kerfs in the tubes) and then welding all seams are an adaptation of structural welding, this design having first been used in tubular roof trusses.

Desirability of Further Research

Thus it is seen that welding is at present an entirely practical and recognized process for the fabrication of aircraft fuselages and other parts. Future developments must, therefore, be in the nature of refinements.

J. B. Johnson, Chief, Material

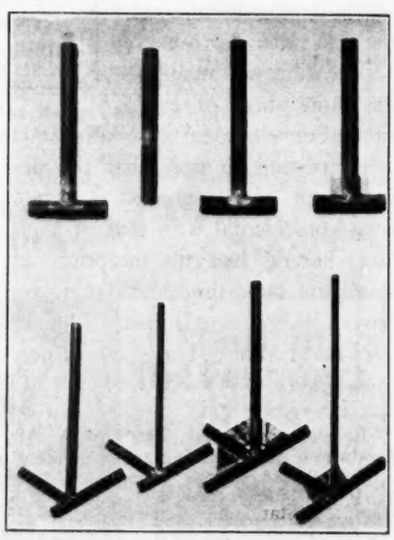


Figure 3. — Types of Welded Joints Being Tested by the Bureau of Standards

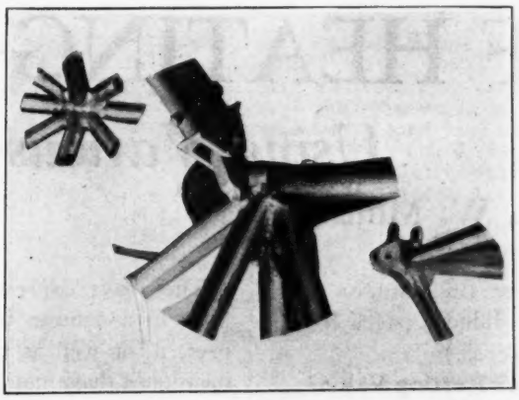


Figure 4.—Some Types of Joints with Many Members Coming Together.

Division, Army Air Corps, Wright Field, Dayton, Ohio, said in a paper presented at the annual meeting of the American Welding Society in September, 1927: "There are no established rules for the design of welded joints which are directly applicable to aircraft. The Air Corps has published a few for the assistance of designers which are based on the results of tests and service requirements. A reduction of 15,000 pounds per square inch in the tensile strength of a chrome-molybdenum steel having an ultimate strength of 95,000 pounds per square inch is recommended as a conservative figure for a straight butt weld. If the joint has a fish-tail form or is reinforced by gusset plates, the value may be increased and designs have been approved in which an allowable stress of 95,000 pounds per square inch has been used in calculation."

A new design for an airplane is checked by experts of the Aeronautics Branch of the Department of Commerce to determine whether or not it is air-worthy. Since available information on the strength and other properties of welded joints was not considered adequate by the Aeronautics Branch for checking airplane designs, the Bureau of Standards was requested to conduct an investigation of the subject, which is now nearing completion.

From these commentaries it is seen that aircraft welding in its present state may be considered a product of natural growth, which has not yet received its share of scientific research, although certain individuals have been very active in the latter field. Having achieved its remarkable success under these conditions, it is reasonable to assume that considerable further improvement can be made.

Work of the Bureau of Standards

The investigation now in progress at the Bureau of Standards includes 134 different joints of the "T" and "lattice" types. Materials used are mild steel under Army specifications No. 57-180-1, which is the same as S.A.E. No. 1025, and chrome-molybdenum steel under Army specification No. 57-180-2, which is the same as S.A.E. No. 4130X. By systematically varying the designs of the joints, including dimensions of inserted gusset plates, where used, and noting the effect on the strength, weight and cost, the most efficient types of joints will be determined. Handbook information concerning these joints will be available to all aircraft manufacturers at the conclusion of the investigation. Types of joints being tested at the Bureau of Standards are shown in Fig. 3. The ones on the right are the inserted gusset-plate type, previously mentioned.

Suggestions for Improvement of Present Practice

Welding at the Bureau of Standards is being done in accordance with a "Procedure Control" drawn up by the representatives of the gas-welding industry on the sub-committee on Procedure of the American Bureau of Welding, which is the research department of the American Welding Society. A "Procedure Control" is a detailed production specification covering: (1) Check of welders' ability, (2) selection and inspection of materials, (3) design and layout of welded joints, (4) preparation for welding, (5) welding technique, and (6) inspection and tests. Experience with procedure control in other fields where strength and reliability are paramount has shown that it does insure work of uniform high quality. A carefully prepared procedure control removes the human element and places the responsibility for good welding upon the de-

(*Continued on Page 26*)

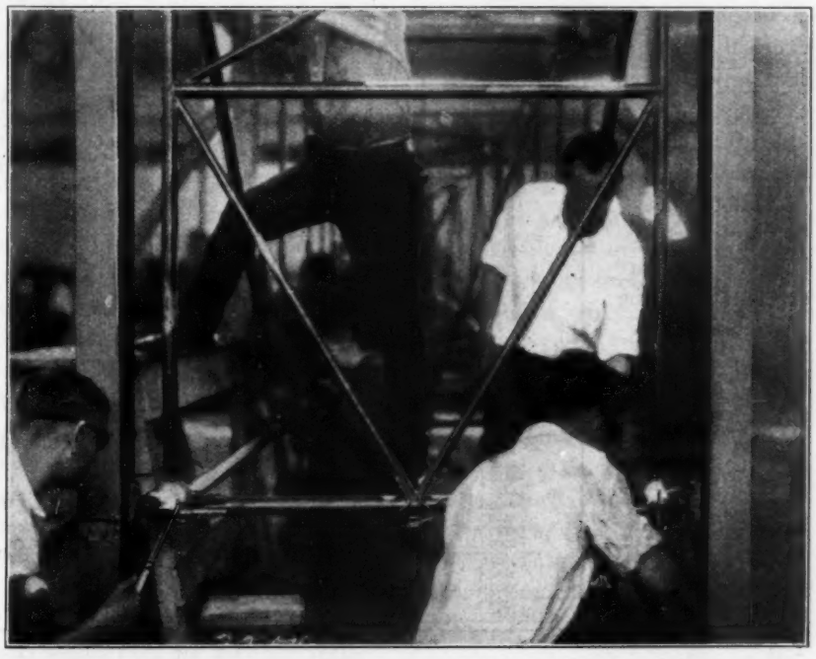


Figure 5.—Type of Jig Used in Fuselage Construction

THE COST OF HEATING—

Using Various Fuels

By L. W. Millis

IT IS manifest that any discussion involving the comparative cost of fuels must have a starting point and also a limitation. I am, therefore, telling you in advance that the figures I bring you are for domestic work and are confined to coal, coke, oil and gas. It is probable that use of the word "confined" is faulty, because comparisons of the cost of various coals is of itself an inexhaustible subject.

You will, of course, recognize that there is a wide difference between laboratory work performed by skilled people, under predetermined conditions, and average results obtained by unskilled persons in practice.

I should also tell you that I am only taking into account quality and price of the various fuels.

Wear and tear on equipment, decorations either external or interior, as well as on clothing, are, in a measure, intangible and are not taken into consideration in this discussion, nor are methods of firing considered.

The National Warm Air Heating Association, with headquarters at Columbus, Ohio, has for a number of years carried on elaborate research work in the matter of residence heating. (See Bulletin No. 189, University of Illinois, pages 86-89, including Table 15.)

What Fixes Heating Value?

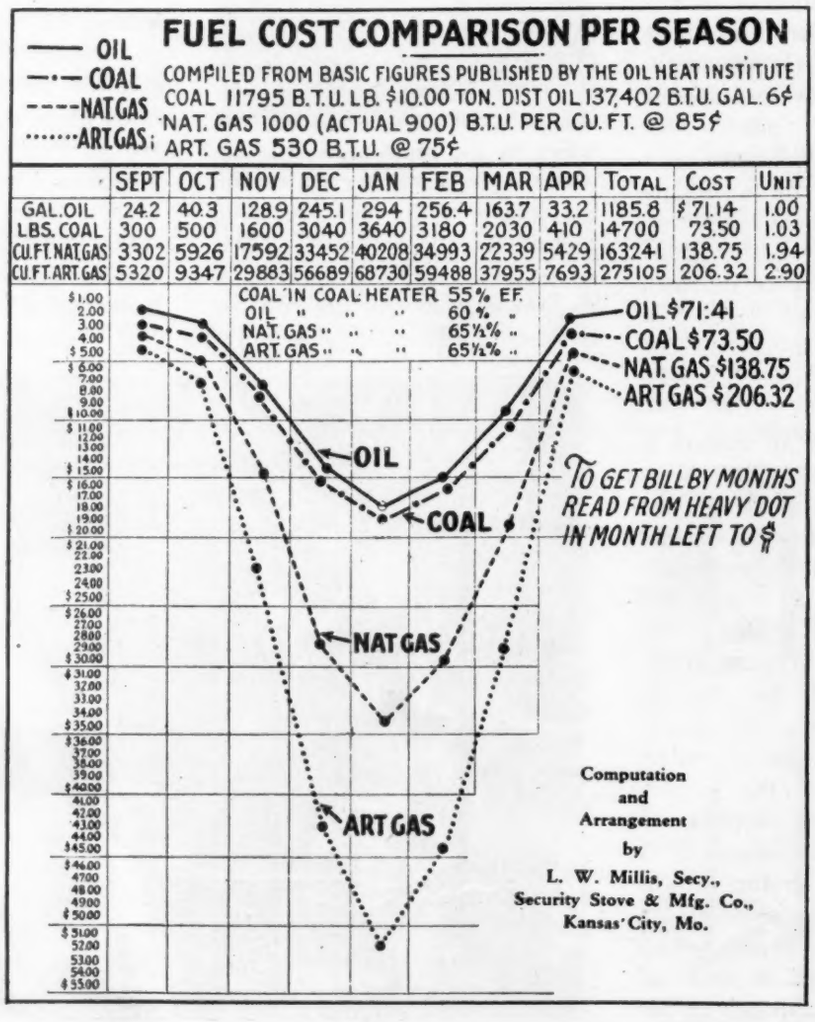
Incidental to that work, a vast amount of very reliable information concerning solid fuels was obtained. The work was done by the Enginering Department of the University of Illinois, under excellent conditions. The results have not been put into bulletin form as yet, but I am certain that price and B.t.u. content alone do not fix the heating value. The volatile matter and ash have definite relations.

They have expressed these relations in a definite formula. However, it, as well as the fuel results mentioned, have not been published. When it is made public it will enable a person to find the price relation that will justify the substitution of one coal for another. Coal with a low B.t.u. content may be the lowest in cost, providing mining or freight costs are low.

You, of course, know that comparisons of solid fuels involves many problems. Before we can compare other fuels with solid fuels, we must find a starting point within the solid fuel range.

Beginning with the fall of 1910, I kept fairly accurate records of the weather and of fuel requirements in my own residence until the spring of 1919. This, you notice, covers a period of nine winters. I have used the information thus obtained to build up a chart of fuel comparisons based upon certain assumptions sponsored by the Oil Heat Institute. This, as you know, is a sort of national organization of oil producers, oil dealers and manufacturers of oil burning equipment.

It takes into consideration the cost of fuel only and within certain



	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	TOTAL	COST	UNIT
GAL. OIL	24.2	40.3	128.9	245.1	294	256.4	163.7	33.2	1185.8	$ 71.14	1.00
LBS. COAL	300	500	1600	3040	3640	3180	2030	410	14700	73.50	1.03
CU. FT. NAT. GAS	3302	5926	17592	33452	40208	34993	22339	5429	163241	138.75	1.94
CU. FT. ART. GAS	5320	9347	29883	56689	68730	59488	37955	7693	275105	206.32	2.90

Table No. 2.

Table No. 3

Efficiency 55% COAL	60% OIL	65½% NATURAL GAS	70% NATURAL GAS	65½% ARTIFICIAL GAS	70% ARTIFICIAL GAS
Number of tons per season	Number of gallons required.	Number of thousand cubic feet required for Conversion equipment.	Number of thousand cubic feet required for Special Gas Heater.	Number of thousand cubic feet required for Conversion equipment.	Number of thousand cubic feet required for Special Gas Heater.
		21.95	20.54	37.28	34.86
5	784	109.76	102.71	186.40	174.31
6	941	131.72	123.26	223.68	209.17
7	1,098	153.67	143.80	260 96	244.03
8	1,254	175.62	164.34	298.24	278.89
9	1,411	197.57	184.88	335.52	313.75
10	1,568	219.52	205.42	372.80	348.62
11	1,725	241.75	225.96	410.08	383.48
12	1,882	263.42	246.50	447.36	418.34
13	2,038	285.37	267.04	484.64	453.21
14	2,195	307.32	287.56	521.92	488.07
15	2,352	329.27	308.12	559.20	522.93

specified limits. The cost of hauling ashes, running motors or other incidentals are not considered.

Table No. 2 makes it possible to show a comparison of a certain coal at a stated price when burned at a certain efficiency with oil under a set condition and also with natural gas, as well as artificial gas. It also makes it possible to know what the fuel bill should be in each winter month, provided, of course, that all the conditions in the chart are met. It would not be difficult to change it to meet other conditions.

In a great many cases people know, or think they know, how many tons of coal they burn during an average winter. Table No. 3 shows how estimates may be made of the quantity of a substitute fuel. Prevailing prices will then indicate comparative cost. As in Table No. 2, there are a lot of set conditions which must be taken into consideration.

The following B.t.u. values of the fuels are used:

Coal, 11,795 B.t.u. per lb. Oil, 137,402 per U. S. gal. Natural gas, 1,000 (actually 900 at ordinary barometric pressure and temperature) and 530 for artificial gas. The efficiency of the heater is assumed to be 55% for coal, 60% for oil, 65½% for gas conversion equipment, and 70% for especially designed gas-burning apparatus.

Suppose you have been burning 8 tons of coal per season, costing $10.00 per ton, or $80.00 for the season. Then you should, with proper equipment, use 1,254 gallons of oil. If it costs 6¼c per gallon, the cost would be $78.90 for the season. If you installed a good gas burner in your heater you would use about 178,000 cubic feet of natural gas. If the charge for gas is 60c per thousand, the season would cost $105.60. Or, if you must use artificial gas at 75c, 298,000 cubic feet would cost $223.50. If you install a heater of ample size and especially designed for gas, you should use 164,000 cubic feet at 60c, amounting to $98.40. Or, if you use artificial gas, there would be 279,000 cubic feet at 75c, or $209.25.

You should bear in mind that no two winters are alike and that families do not use heat in the same manner all of the time, nor are the assumed efficiencies always attainable. However, application of the fuel prices prevailing in your vicinity will give you a fairly accurate estimate of your fuel bill for any of the above conditions. Great care must be exercised in making estimates of gas consumption, as many "gas rates" are intricate and difficult to apply in any specific case.

You can see, from the various samples I have shown you, that comparisons are possible only when the elements entering into the problem are known and definitely stated.

In comparing statements of efficiencies it should be stated whether the efficiency covers from grate to chimney top or from grate to nozzle of boiler or bonnet, if warm air furnace, or covering only the heat delivered in the room by register.

In comparing fuels care should be taken to know that the conditions under which they are used are really comparable. When the user can see the hand of the meter flying in enemy formation, he is more apt to cut down his heat requirements than if the bin is full of solid fuel.

There is often a wide difference between the heat accepted as satisfactory to a user and the heat often created needlessly.

S. N. Straus & Co. Sees Upward Trend in Building

In their monthly survey on building construction, S. W. Straus & Company, New York, report that building permits issued or plans filed in 590 leading cities and towns in 48 states indicate an upward trend in building activities. April permits granted in the 590 cities totaled $538,446,781, compared with $347,949,526 in April, 1928.

April permits also showed a gain over those of March this year, which totaled $408,667,003. The normal seasonal variation between the two months, the report states, is a 1 per cent decline.

Of the 25 cities which led the country in plans or permits in April, 16 showed gains over the preceding month and the preceding year and 17 reported larger volumes this April than for April, 1927.

Chicago showed a loss this year from both April, 1928, and April, 1927. Among the cities in which there was a definite upward trend are Baltimore, Washington, Detroit, Minneapolis, Milwaukee, Houston, San Antonio, Seattle, Hartford, Birmingham, Oklahoma City and Tulsa. There has been a marked falling off in such activities in the suburban areas in large cities.

POINTED STAR DEVELOPMENT WORKS FOR ACCURACY IN STUDENT

By O. W. KOTHE

THE YOUTH of our trade have much to look forward to. Specialization plays its part.

The younger generation of mechanics enjoys penciling with stars and odd geometrical shapes, and older folks also find mental refreshment at certain peculiar treatments such as we show in the opposite illustration. So above No. 9 we show the elementary principles of a five pointed star is a pentagon, a geometrical shape having five equal sides. So at diagram "A" we first describe a circle to cut the points or form the corners of a pentagon. This circle can be divided with compasses into five equal parts as shown. Or it can be done geometrically as at "B."

Inscribed Pentagon

Here we show how to develop an inscribed pentagon where we first draw the vertical and horizontal lines through the center of circle b. Next we bisect the radius b-c, as in point d, and using d as center and d-1 as radius, strike arc 1-e. After this pick radius 1-e, and using 1 as center, strike arc 1-2. Observe 1-e is the length of one side, and with this as radius we can step off the remaining sides. If your points do not come out correctly, then your pencil points or dividers are too thick; but when you are accurate, your lines must work out. This enables drawing the outline 1-2-3-4-5-1 and we have the pentagon finished.

If we should draw lines from each corner to the center b, as at "C," we would have the top view of a pentagonal pyramid used in the construction of 12-pointed stars, as we shall see later.

In Fig. 10 we have a 5-pointed star cookie cutter, which readers can make and present to the household in which they live. Its general design is done identical as our next problem and a narrow strip made of tin about ¼ to ⅜ inch wide is soldered along the edge as the dotted line indicates. Here "D" is the top view and "E" is the edge view.

In this article Mr. Kothe has shown how to develop multi-pointed stars, giving the geometrical development. This detailed description is presented not so much with the idea of showing how to make stars, but rather to give the student material requiring minute accuracy so as to teach him to see the value of keeping accuracy uppermost in mind in all things that he does.

It is one thing to detail an article accurately on paper and quite another to reproduce the same thing in metal, and a thorough sense of accuracy is, therefore, vitally important.

Geometry of 5-Pointed Star

In our drawing No. 11 we show the geometry for a 5-pointed star. Here we have the circle divided into five equal parts and lines drawn from 1 to 3 and 1 to 4; also 2-5, 2-4 and 3-5, which gives the outline for the figure. Next, by drawing hip and valley lines, as 1-x and a-x, the star is completed. At "F" we show the sectional elevation, giving the rise at the center of star, as h-t. Then at "G" we show the true length of the hip line 1-x and the valley line x-a of plan. So if we pick line 1-x and set it as t'-1, then h'-1 will be the true length of hip line. Next pick the valley line a-x and set as t'-a, and h'-a will be the true length.

To set out the pattern draw any line as A-B, shown below No. 11, equal to h-1 of "G." Then pick the valley line h'-a from "G," and using A as center, strike arcs, as at

How to Work Out the Pattern as Detailed

C. Next pick the base line 1-a of plan, and use B as center. Cross arcs as in point C. This enables drawing the outline for the pattern. In our case it requires five of these patterns to make the star.

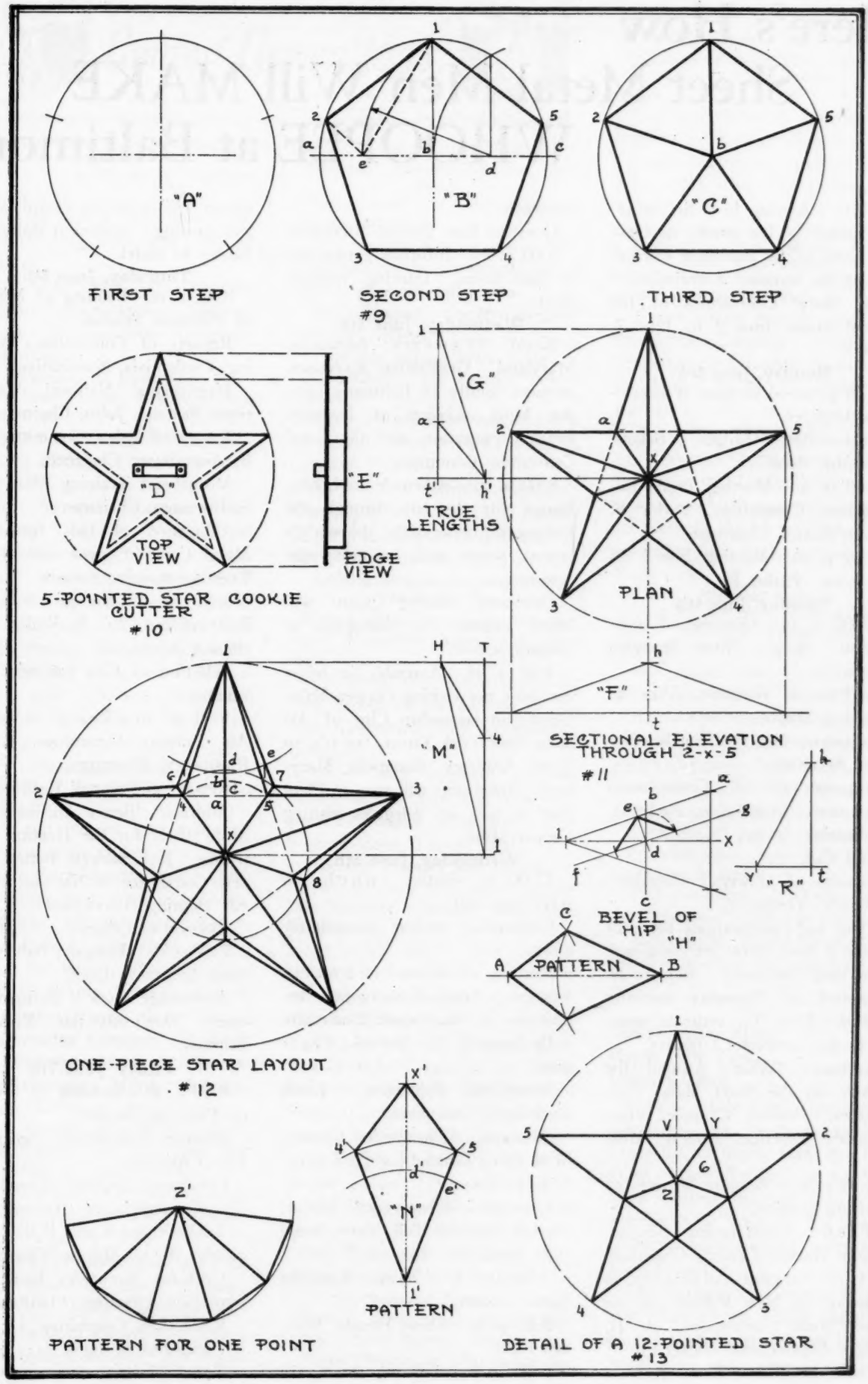
Locating Bevel

If it is desired to find the bevel to which the pattern must be bent, we can follow the diagram "H." Here one of the points of plan are reproduced, where 1-x is the hip line and 1-a is the side base line. It so happens in this case that the height h-t of "F" is equal to x-a of "H," and so 1-a of "H" will also be the true diagonal section. So perpendicular to the hip line 1-x draw b-c, and also draw d-e perpendicular to 1-a. Next draw line f-g through d and sweep points of line b-c to line f-g, which will enable drawing the bevel lines shown by the heavy outline. Each of the patterns when bent to this bevel should fall right in place and fit perfectly.

Star in One Piece

Now and then a person comes across a star, as at Fig. 12, that is made in one piece. Now this is possible up to a point where the rise in the center is not greater than the metal can provide for. The outline of star as indicated by lines

(*Continued on Page* 28)


"A"
"B"
"C"
FIRST STEP
SECOND STEP
#9
THIRD STEP
"D"
"E"
TOP VIEW
EDGE VIEW
5-POINTED STAR COOKIE CUTTER
#10
"G"
TRUE LENGTHS
PLAN
"F"
SECTIONAL ELEVATION THROUGH 2-x-5
#11
"M"
ONE-PIECE STAR LAYOUT
#12
BEVEL OF HIP
"H"
PATTERN
"R"
"N"
PATTERN
PATTERN FOR ONE POINT
DETAIL OF A 12-POINTED STAR
#13

Here's How Sheet Metal Men Will MAKE WHOOPEE at Baltimore

THE following is a list in sequence of the events as these will occur at the Baltimore convention of the National Association of Sheet Metal Contractors of the United States June 3 to June 7, 1929:

Monday, June 3rd

1:30 p. m.—Everyone is expected to Register.

Registration, badges, tickets, mezzanine floor.

3:00 p. m.—Meeting Trade Development Committee. Parlor F. George Harms, Chairman.

8:00 p. m.—Meeting Board of Directors. Parlor F.

Tuesday, June 4th

10:00 a. m.—Opening of convention. Song: "Star Spangled Banner."

Address of Welcome, Wm. F. Broening, Mayor.

Response, W. C. Markle, National Secretary.

Appointment of Committees: Resolutions, Credentials, Auditing, Nominating.

Roll Call.

Reports of Officers: President, Secretary, Treasurer.

Plans and specifications for estimating a sheet metal job completed by a local contractor. Bids to be submitted at Thursday morning session. Prize for estimate nearest to the contractor's figures.

Address: "What's Around the Corner for the Sheet Metal Contractors," Bennett Chapple, Vice-President American Rolling Mills Co.

1:30 p. m.—Reading Minutes of Previous Session.

Trade Development Session. George Harms, General Chairman.

"How National Advertising Is Opening Up New Market for the Sheet Metal Contractors," A. H. Galley, International Nickel Co.

Code of Ethics, Louis Rysdon, Chairman.

Question Box, general discussion.

9:00 p. m.—Informal get-together, Ball Room. Dancing, refreshments.

Wednesday, June 5th

Naval Academy, Annapolis, Maryland. Graduation Exercises, auspices jointly of Baltimore Copper Mills, division of Republic Brass Corporation, and the Local Convention Committee.

8:00 a. m.—Assemble in Lobby. Busses for the trip through the Baltimore Copper Mills, the world's largest copper plant, for those who care to go.

Delegates visiting plant will board steamer for Annapolis at company's pier.

9:30 a. m.—Assemble in lobby for those not visiting Copper Mills. Busses to steamship City of Atlanta, foot York Street, for trip to Naval Academy, Annapolis, Maryland. Steamship will stop at Plant Pier to pick up delegates visiting Copper Mills.

Wednesday, June 5th

12:00 m.—Buffet luncheon served on boat.

Convention session immediately after.

Reading of Minutes of Previous Session. Allied Construction Industries. C. W. Pansch, Chairman.

By-Laws, J. E. Merrick, Chairman.

Vocational Education. Louis Luckhardt, Chairman.

Address, "Twentieth Century Methods of Combatting Corrosion," J. T. Hay.

Convention Photograph, on arrival at Bancroft Hall, Naval Academy, Annapolis, Md.

3:30 p. m.—Naval Academy Band Concert.

5:00 p. m.—Dress Parade, Worden Field.

6:00 p. m.—Leaving Annapolis, dinner will be served aboard. Music and dancing. Arrival at Baltimore. Busses to Hotel.

Thursday, June 6th

8:45 a. m.—Reading of Minutes of Previous Session.

Reports of Committees: Auditing, Credentials, Nominating.

Inter-related National Associations, Rudolph Jobst, Chairman.

Report of Labor Committee, W. F. Angermyer, Chairman.

Mooseheart Training Plan, Fred S. Bremmer, Chairman.

Tabulation of bids for Sheet Metal Contract given out at the Tuesday morning session.

Address, "What an American Railroad Buys," C. E. Walsh, Purchasing Agent.

Selection of City for next convention.

1:30 p. m.—Report of Warm Air Furnace Committee, E. H. Riesmeyer, Chairman.

Report on Railroad Certificates.

Address, "Better Business and More of It for the Heating Contractor," Jack Stowell, Better Business Committee of National Warm Air Heating Association.

Election of Officers.

7:00 p. m.—Banquet, Ball Room, Lord Baltimore Hotel.

A message from a distinguished orator. Don't miss this. By W. B. Burruss.

Friday, June 7th

8:30 a. m.—Reading of Minutes of Previous Session.

Finance Committee, George I. Ray, Chairman.

Overhead Expense Committee, Otto Geussenhainer, Chairman.

Trade Relation and Policy Committee, W. C. Markle, Chairman.

Uniform Mechanics Lien Law, Otto Geussenhainer, Chairman.

Resolutions Committee.

Unfinished business.

New business.

Humidifiers for Side Wall Register Shields

From Young Hardware Company, Bellevue, Iowa.

Can you tell us who makes humidifiers for side wall register shields?

Ans.—The Hall-Neal Furnace Company, Indianapolis, Indiana, and W. F. Gammeter Company, Cadiz, Ohio.

Commercial Enameling

From the Phoenix Company, Texarkana, Texas.

Please refer us to number of concerns in Chicago who do commercial enameling.

Ans.—Benjamin Electric Manufacturing Company, 128 South Sangamon street; Chicago Vitreous Enamel Product Company, 1425 South 55th court; Republic Enameling Company, 1128 West Van Buren street; Variety Enameling and Finishing Company, 619 Root street, and Chicago Hardware Foundry Company, 549 West Washington boulevard.

Steel Septic Tanks

From H. E. Hessler Company, Syracuse, N. Y.

Can you tell us who manufactures steel septic tanks?

Ans.—Hart Manufacturing Company, 2006 High street, Louisville, Kentucky; Murphy and Walsh, Pekin, Illinois; Riter-Conley Company, Pittsburgh, Pennsylvania; American Beauty Stove Company, Erie, Pennsylvania; John Wood Manufacturing Company, Philadelphia, Pennsylvania, and Chicago Boiler Company, 1965 Clybourn avenue, Chicago.

Copper Wire Cloth

From Capital City Tin Shop, 208 Third street, Des Moines, Iowa.

Please tell us who makes ½-inch mesh No. 12 copper wire hardware cloth.

Ans.—F. P. Smith Wire and Iron Works, 2346 Clybourne avenue; The W. S. Tyler Company, 310 South Michigan avenue, and American Fabrics Company, 208 South LaSalle street; all of Chicago.

"National" Damper Clips and Tail Pieces

From Capital City Culvert Company, Madison, Wisconsin.

We should like to know who manufactures the "National" line of damper clips and tail pieces.

Ans.—United States Register Company, Battle Creek, Michigan.

Flexible Copper Wire Cable

From Klentzer and Klentzer, Fowler, Indiana.

Please inform us who makes flexible copper wire cable ¼ inch, ⅜ inch and ½ inch?

Ans.—L. K. Diddie Company, Marshfield, Wisconsin, and Sueske Brass and Copper Company, 15 North Peoria street, Chicago.

Address of Iowa Warming and Ventilating Co.

From Metzner Stove Repair Company, 515-17 Wyandotte, Kansas City, Missouri.

We would very much appreciate your giving us the address of the Iowa Warming and Ventilating Company.

Ans.—This concern is now known as the American Warming and Ventilating Company, 1017 Summit street, Toledo, Ohio.

Electric Fixtures and Fittings

From Riverside Hardware Company, 2231 Riverside boulevard, Sioux City, Iowa.

We would like to have catalogs from makers or jobbers of fixtures and fittings of electrical goods that cater to the hardware trade.

Ans.—Refer to: Efengee Electrical Supply Company, 12 North Jefferson street; Hyland Electrical Supply Company, 700 West Jackson boulevard; Manhattan Electrical Supply Company, 122 West Illinois street; Triangle Electric Supply Company, 600 West Adams street, and Metropolitan Electric Supply Company, 321 South Desplaines street; all of Chicago.

"Serv-Us" Range

From L. R. Hamman, 507-511 East Prairie avenue, Decatur, Illinois.

Please inform me who makes the "Serv-Us" Range.

Ans.—Orbon Stove Company, Belleville, Illinois.

Importers of Swiss Dairy Supplies

From L. R. Pease, Monticello, Wisconsin.

Can you tell me of someone who imports Swiss dairy supplies.

Ans.—Majonner Brothers Company, 4601 West Ohio street, Chicago.

Stokers—"Economy"; "Stoker-Matic Domestic"; "Motor Stoker Automatic Coal Burner"

From Leo A. Tilford, 1224 Loeser avenue, Jackson, Michigan.

Please advise me who manufactures the Economy stoker; the Stoker-Matic Domestic Stoker, and the Motor Stoker Automatic Coal Burner.

Ans.—The "Economy" is made by Hawley - Richardson - Williams Company, 600 Dooly Building, Salt Lake City, Utah, and the other two are made by the Motor Stoker Corporation, 250 Park avenue, New York City.

"Geneva" Stove

From Metzner Stove Repair Company, 515-517 Wyandotte, Kansas City, Missouri.

We should like to know who makes the "Geneva" Stove.

Ans.—This stove was at one time made by the Portsmouth Stove and Range Company, Portsmouth, Ohio, for the Wm. G. Fisher Stove Company of Cincinnati, Ohio.

"National" Tubular Furnace

From Livingston Sheet Metal Works, Livingston, Montana.

Will you please tell us who makes the "National" Tubular Furnaces?

Ans.—P. H. Magirl Foundry and Furnace Works, Bloomington, Illinois.

Central Alloy Steel Moves New York District Office

Central Alloy Steel Corporation, Massillon, Ohio, has moved its New York district offices from the Pershing Square Building to the New York Central Building, 230 Park Avenue, New York. A. W. Minuse is district sales manager in the New York district.

The company has moved its Detroit office to the Fisher Building, West Grand Boulevard and Second Street.

WHO'S WHO, WHERE!

SAN FRANCISCO, CAL.—The Humboldt Sheet Metal Works has moved from 1687 to 1674 Geary street.

The Western Rotary Ventilator Co. has moved from 447 Hampshire to 361 Brannan street.

PORTLAND, ORE.—R. Wafler has engaged in the furnace and roofing business at 6408 East 82nd street.

MINNEAPOLIS, MINN.—Heating Systems, Inc., 1806 N. Washington street, has the warm air heating contract for the residence of W. G. Iverson.

ST. PAUL, MINN.—The U. S. Roofing & Painting Co., 1499 University avenue, has the roofing and sheet metal work contract for $1,200,000 office building of Lincoln Holding & Development Co.

The Gross Metal Products Co., 2527 W. Como Avenue, has the metal door and window frame contract for hotel building of Geo. Murray, Faribault, Minn.

The University Sheet Metal Works, 981 University Avenue, has been awarded the roofing and sheet metal contract for the parochial school in Dickinson, N. D.

DES MOINES, IA.—The Green Furnace Co., 3rd and Elm streets, has been awarded the warm air heating contract for residence of L. Oransky.

CEDAR RAPIDS, IA.—Ilten & Taege, 325 4th Avenue W., has the warm air heating contract for the James Bromwell residence.

DAVENPORT, IA.—Jens Nielsen, 807 W. 4th Street, S., has the heating contract for furnace in residence of Chas. W. Hintermeister.

WATERLOO, IA.—The Bennett Heating Co. has the warm air heating contract for the double residence of Jack Southerland.

SAN FRANCISCO, CAL.—The Capitol Art Metal Works, 1129 Howard street, has the sheet metal contract for factory of the Glidden Co. at Berkeley, Cal.

Lowell Davison, 1670 San Jose Avenue, has the sheet metal contract for the Roosevelt Junior High School here.

The Atlas Heating Co., 557 4th street, has the sheet metal contract for the residence of Bud Howard.

DELANO, CAL.—J. E. Pettijohn has the sheet metal contract for school buildings in Taft and Ford City, Cal.

DAVENPORT, IA.—R. Clausen, 617 2nd street, has the warm air heating contract for residences of H. Voris and E. S. Whouseller.

The Steinhaus Heating Co., 124 Harrison, has the warm air heating contract for residence of Harry Rathjen.

OMAHA, NEB.—The Gate City Furnace Co., 3131 Burt street, has been awarded the warm air heating contract for residence of I. Ward.

LOS ANGELES, CAL.—The Atlas Cornice Works has the sheet metal work contract for dormitory building of Petrolium Securities Co., in Westwood district.

Emil Brown, 300 E. 9th street, has the sheet metal contract, and the National Cornice Works, 1323 Channing place, the tin clad door contract for office building of the Long Beach Professional Building Corporation in Long Beach, Cal.

The Arcade Cornice Works, 721 E. 12th street, has been awarded the sheet metal contract for the Hersh & Kohn apartment building.

CEDAR RAPIDS, IA.—The Hawkeye Tin Shop, 92 2nd Avenue E., has been awarded the warm air heating contract for residence of Bert Scott.

DAVENPORT, IA.—The Weir Steel Furnace Co., 807 W. 4th street, has the warm air heating contract for residence of Chas. W. Hintermeister.

The Davenport Metal Specialty Co., 1232 W. 5th street, has been awarded the warm air heating contract for residence of Bernard Roes, Jr.

TULSA, OKLA.—The Dean & Day Sheet Metal Co., 1635 E. 11th street, has just closed contracts for warm air heating for residences of Glenn A. Hollinger, T. M. Murray and C. D. Cooper.

The Nu-Way Furnace Co., 206 N. Denver, has the warm air heating contract for the residence of H. R. Moffitt.

BALTIMORE, MD.—The Wm. F. Zeller Co., 613 W. Cross street, has the roofing and sheet metal work contract for the addition to the plant of the Continental Can Co.

WASHINGTON, D. C.—Wm. E. Cotton & Co., 1525 Lamont Avenue, has the roofing and sheet metal work contract for the $17,000,000 Department of Commerce building.

DAVENPORT, IA.—Jens Nielsen, 807 W. 4th street, has been awarded the sheet metal contract on the Industrial Arts Building to be erected for the Mississippi Valley Fair Association.

TULSA, OKLA.—Nu-Way Furnace Co., capital $50,000, has been incorporated by G. T. Bynum, A. C. Sweeney and F. F. Shoemaker to take over the manufacture of domestic furnaces from Tulsa Stove & Foundry Co.

PITTSBURGH, PA.—The Brighton Road Roofing & Furnace Company, 3170 Brighton Road, has been awarded the contract for the sheet metal work, roofing and warm air heating for the twenty-six homes being built by Evans & Newhams. It is said that Rudy furnaces will be installed.

SAN FRANCISCO, CAL.—Fenton & Son have moved their sheet metal works from 11 to 48 Tehama street.

SPOKANE, WASH.—The Spokane Stove & Furnace Repair Works, W. 916 1st street, is erecting a new foundry at E. 1023 Marietta street.

Williams Oil-O-Matic Corp. to Hold Fifth Meeting at Bloomington, Ill., June 3

The Williams Oil-O-Matic Heating Corporation, Bloomington, Illinois, makers of the Williams Oil-O-Matic oil burner, will hold its fifth International convention in Bloomington June 3 and 4, 1929.

It is expected that over three thousand delegates will be in attendance at this convention.

Every phase of the oil burner industry will receive consideration at this meeting. Many new developments in the industry and particularly in the company products will be revealed to the attending delegates. Sales methods, installation practice, technical discussions, together with plenty of entertainment—music, dancing and eats.

AUTOMATIC STOKERS

(*Concluded from Page 23*)

city air contain 65 per cent unburnt fuel. Thus are lost 3,000,000 pounds of high volatile fuel. The time is rapidly coming when officers and homes in great cities will be supplied with purified air through local cleansers and automatic stoking of heating equipment.

The Iron Fireman

The Iron Fireman is manufactured by the Iron Fireman Manufacturing Company, Portland, Oregon. It is of the underfeed, force draft type. A screw operated by an electric motor forces the coal from the storage hopper in front of the furnace into the firebed from underneath. In this way the coal is heated before it reaches the burning fuel and the volatile matter is driven off, passing up through the hot bed of coals and being burned before reaching the chimney.

The same motor that operates the screw feed also spins the blower for the forced draft.

The device is thermostatically controlled. The controls are so arranged that when heat is required by the dropping of the temperature in the rooms above, the control switch is automatically cut in which in turn opens the drafts and starts the stoker. The stoker itself is so timed that it works for short intervals only and is cut in and out during the entire time that the call for heat continues from above. The functioning of the stoker is so synchronized that during warm weather when the call for heat is not likely to be frequent enough to keep the fire going by changes in the temperature, the fire is stoked independently of the room temperature so that it does not go out. Stoking under these conditions is timed for rare intervals so that there is no waste of fuel.

Warm Air Furnace Installers Display Interest in AUTOMATIC STOKERS

The Combustioneer

Several manufacturers now offering apparatus specially designed for use with Coal-Fired Domestic Warm Air Furnaces.

By GEORGE DUERR

THE automatic stoker for the coal-fired warm air furnace is the latest refinement to be presented to the public. It is in effect the coal-fired heating unit industry's endeavor to keep abreast of the public demand for greater economy in the use of fuels consumed for domestic heating, as well as an effort to provide an automatically regulated device with which to compete with the oil burner and gas-fired equipment. The coal dealers especially are active in demanding this type of equipment.

The ever-increasing agitation for elimination of the smoke nuisance has also lent impetus to the introduction of more efficient firing methods. This is indeed a strong point in favor of the coal stoker, because with automatic stoking and forced draft many of the cheaper grades of fuel can be used, effecting a considerable economy over gas and oil heating. A recent statement by Dr. Kegel, City Health Commissioner of Chicago, testifying before the legislative committee on railway electrification bills, indicated that more than 6,000 deaths in Chicago alone were directly traceable to the smoke-polluted air. Such revelations when given currency are bound to increase the demand for stoking practice that does away with air contamination. Therefore the furnace installer who wants to expand in his business will be interested in getting information on this latest development.

Three General Classifications

In general there are three types of automatic stokers; namely, the traveling or chain grate type, the overfeed, and the underfeed types. In the chain grate stoker the grates are so made and placed that they pass under the coal hopper on into the fire box, and in so doing draw the fuel from the hopper into the fire box of the boiler. Their use is confined for the most part to the large industrial type boiler.

The two remaining types are suitable for installation in warm air heating units.

In the underfeed type the fuel is taken from the hopper, located at the front of the furnace, and propelled either by the action of a screw feed or plunger feed into the fire box and up under the burning fuel bed.

In the overfeed type the fuel is brought into the furnace by the screw or plunger method, similar to that in the underfeed stoker, and is dropped on top of the burning fuel bed, instead of being forced up under the fuel bed as in the former case.

In the screw method of propelling the coal into the fuel bed the power is generally provided by an electric motor. In the case of the plunger method the plunger or piston is operated either by steam or hydraulic pressure.

In all cases the automatic feature is brought about by means of thermostatic control, which in turn is governed by the temperature in some central location of the dwelling. When the temperature in the rooms gets to a point where more firing is needed, the electrical contact is made which sets the stoker motor into operation.

The majority of these stokers are also equipped with a small blower that provides controlled draft as well as controlled firing.

Advantages Claimed Over Hand Firing

It is claimed by the manufacturers of these devices that not only

The Public Demand for

CONVENIENCE and EC

in burning LOW GRADE co

has made Industrial
available to hon

STOKERS *offer*

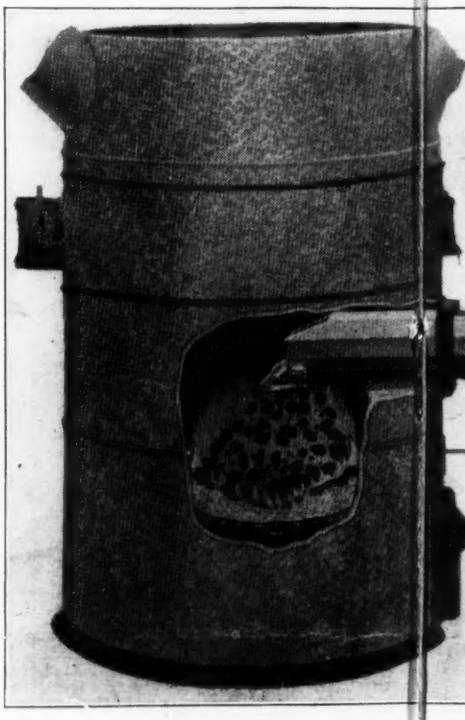
Automatic Controlled Firing—

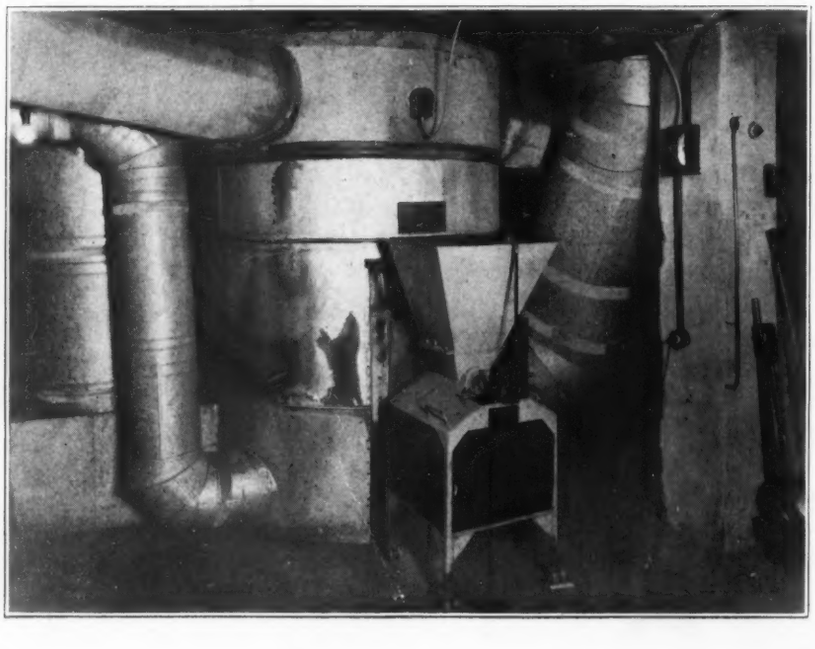
Controlled Forced Draft—

Preheating of both coal and air—

Thermostatic Control

Full heat value from coal consumed





is the firing of the furnace made entirely automatic, but greater economy is effected in fuel consumption and the smoking of the chimney is almost entirely eliminated.

In the case of the underfeed the coal is subjected to a coking process before it reaches the burning fuel bed, which drives off the gases and these are ignited and burned on their way up through the fuel bed. In this way the coal is entirely burned by the time that it is forced up to the top of the fuel bed and pushed aside.

A similar action is said to take place in the overfeed type of stoker. In this case the coking process occurs while the fuel is still in

The Stokers
shown on th[is] pa[ge]
manufactured b[y]

upper right,
the *Superior*
Superior Stoker
poration,

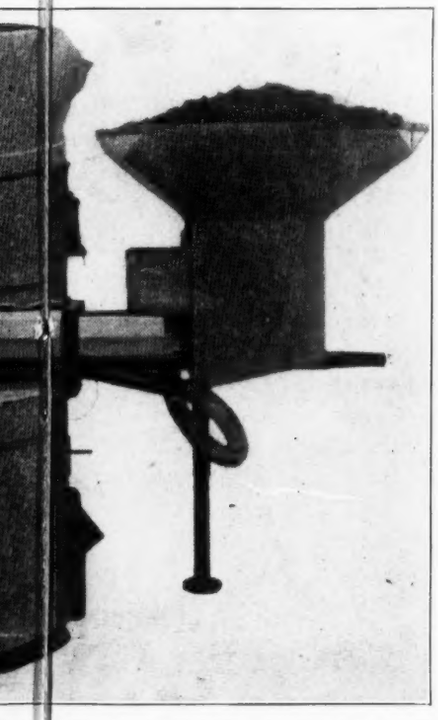
cent[er],
the G. & M.,
Gray & Mur[doch]
Co.

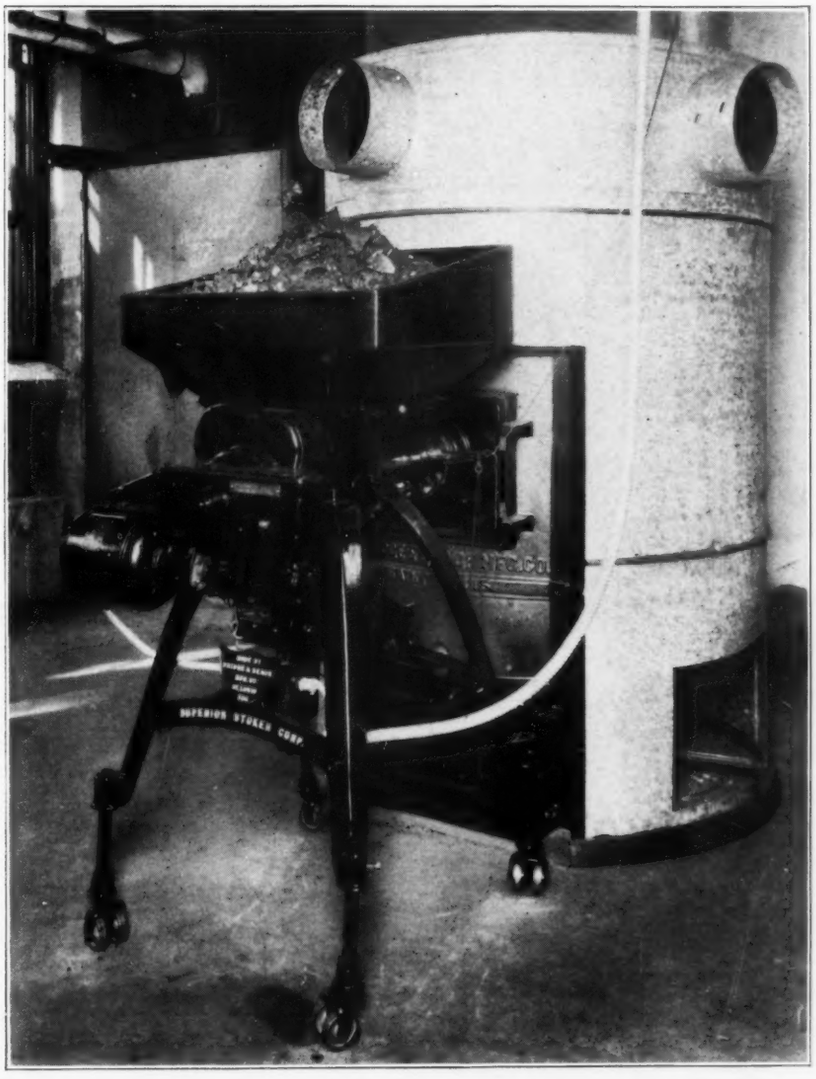
lower left,
the *Johnson*,
the Burnham Mf[g]

CONOMY

coal

rial firing methods home owners





e Stokers
n th s page are
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er right,
Superior,
r Stoker Cor-
ration,

enter,
F. & M.,
Murdock Mfg.
Co.,

ver left,
Johnson,
ham Mfg. Co

the feed chute, where it is preheated before actually dropping onto the burning fuel below. In neither case is the fuel introduced into the furnace in an entirely cold state, as is the case when the heating unit is fired by hand.

The air, too, that is introduced into the heating unit is subjected to preheating by passing through a portion of the air channel that is in proximity to the burning fuel before entering the fire box.

A few of these stokers, illustrating both the underfeed and overfeed principle, are presented herewith.

Combustioneer

Combustioneer, Inc., 1829 South 55th Avenue, Chicago, manufactures the Combustioneer automatic stoker, suitable for application to warm air heating equipment.

It consists of a compact machine, placed on the floor in front of the heater, with the retort, or fire-pot projecting through the ash door into the furnace, taking the place of the grates. It is driven by a small electric motor.

A large hopper is mounted over the machine. This hopper is filled with fine coal, generally 1¼ inch or 2 inch screenings. This filling, depending upon the weather, is necessary about once in 12 to 24 hours.

The coal is fed by a feeding device driven by the motor, and adjusted for any rate of feed desired by a lever. From the bottom of the hopper fuel is forced by a steel screw into the retort, inside the furnace, where the fresh fuel is constantly forced up into the fire from below. This is underfeed principle.

At the same time the coal is forced into the fire, a fan, driven by the same motor, blows combustion air through a duct out through tuyeres or nozzles, surrounding the coal retort. As the coal is forced up through the fire it becomes heated and its gases distill off. These gases, which appear as smoke in inefficient, hand-fired furnaces, become heated in passing through the hot fire bed, are also mixed with the air from the fan, and are completely burned up in the space just above the fire. This not only entirely prevents smoke, but also secures all the heat from the coal—as smoke is wasted heat.

As the coal is forced through the fire bed, the gases are first con-

sumed and then the fixed carbon, the portion of the fuel that makes glowing coal.

The air from the fan is proportioned so that just the right amount is furnished to burn all the fuel without excess air. This controlled air supply eliminates the variations of efficiency found with the varying natural draft.

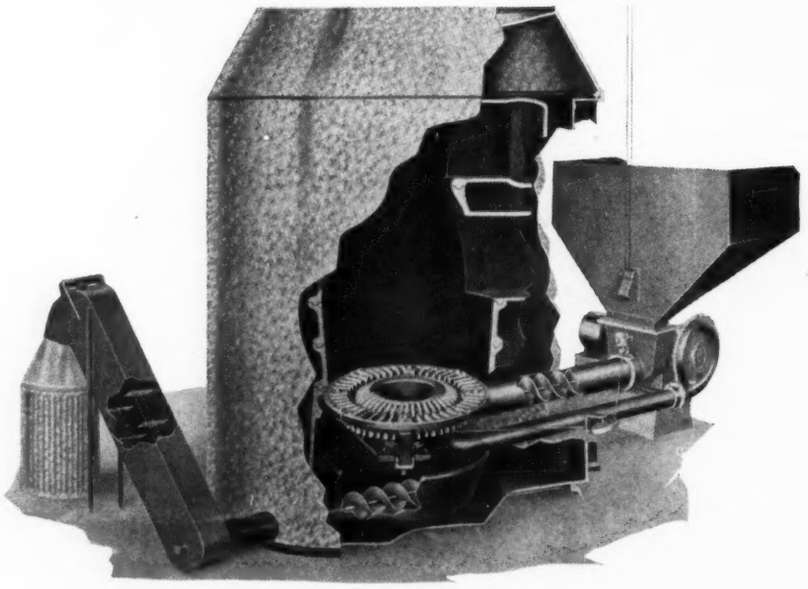
The heat content of the coal is consumed, and for this reason the refuse, or ash, left is very small.

This refuse is forced to the sides of the furnace, and two minutes, three or four times a week is usually all the time needed to remove it through the firing door, which is not closed up by the machine installation.

This feature also affords another advantage. If the electric supply fails, the fire can easily be kept up through this firing door until the emergency is past.

Superior

The Superior Stoker Corporation, 4204 North Union Boulevard, St. Louis, Missouri, manufactures the Superior, which effectively illustrates the overfeed type of stoker.



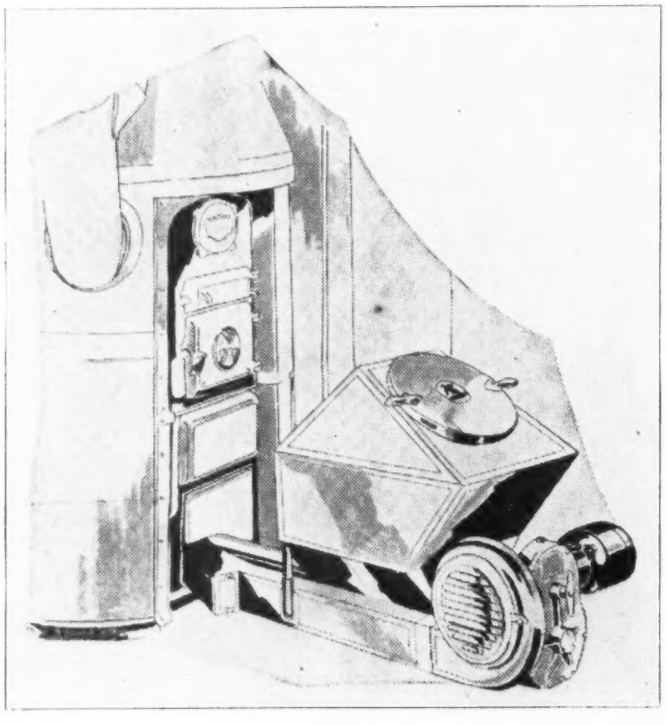
The Turner

This stoker requires no change in the furnace grates for installation. You unpack it, set it up, lift off the furnace door and push the stoker in position for operation. The only installation work is the thermostat and timing device.

It is automatically operated by a Minneapolis - Honeywell thermostat and a specially designed timing device which provides for temperature control upstairs and proper intermittent firing at the furnace. When heat is needed in the house, the thermostat opens the draft and closes the check on the furnace. The timer allows the motor to feed the fire from 1 to 1½ minutes, then shuts it down for a period of 10 to 15 minutes. The feeding and rest periods are automatically repeated until the temperature in the house closes the thermostat. The entire mechanism is at rest and the drafts are closed until the thermostat calls for more heat in the house.

Coal grinders permit handling of coal from the finest screenings to pieces 3x2. By feeding a small quantity of crushed coal at a time, the pulverized portions are immediately burned and the remainder is quickly coked, thus forming a fuel bed that will hold fire for hours.

"This method of firing provides the ideal fire for household heating in any kind of warm air furnace," says John B. Marquis, President of the Superior Stoker Corp., "and it does it with any kind or grades of coal, from Pennsylvania anthracite



The Iron Fireman

down to Belleville bituminous screenings."

"The method of feeding produces the minimum amount of smoke, and any furnace fired with this stoker will never violate a smoke ordinance. The head of the Smoke Abatement League of St. Louis stated that our stoker never exceeded a 'No. 1 smoke' even at feeding time."

The fuel hopper holds 250 pounds of coal and requires refilling about once a day in the average home.

The Johnson

The Burnham Manufacturing Company, Boise, Idaho, makes the Johnson automatic stoker. This stoker is also of the overfeed type. This stoker is made in one size only, but is suitable for use on any size of domestic heating unit.

It is designed to burn cheap, slack coal. Coal is fed to the fire through the worm passing through the cast sleeve protector, where the fuel is preheated before dropping onto the specially constructed grate below, which contains the lower air blast under pressure. The volatile gases are quickly driven out of the fuel bed to come in contact with the preheated oxygen, flamed through the overblast, and are consumed, resulting in an almost complete elimination of smoke.

The blower is equipped with a blast control of lock type, provided for the purpose of insuring continued results after the job is finally balanced. Balancing must be determined by at least one hour's actual operating and contingent on heater combustion space, stack, draft, etc. Installation requires from two to four hours, including the wiring of the controls.

"It is our opinion," said E. C. Johnson of the Burnham Mfg. Co., "that in a very short time coal stoking equipment will far surpass anything in the automatic heat line, especially the owners of warm air furnaces. Our stoker is quiet, easy to handle, and affords all of the conveiences provided by automatic heat, as well as being a sound investment."

The Turner

The Turner Furnace Tender, manufactured by the Uniflow Stoker Corporation, Sidney, Ohio, is an electrically operated, mechanical furnace stoker. The makers of this stoker have gone a little farther with their mechanical device for tending the coal-fired furnace by including a grate shaker and an ash remover.

The Turner stoker is of the underfeed type, the fuel being fed into the grate by screw feed operated by an electric motor. All working parts are enclosed in oil tight gear boxes. The entire machine is constructed as a complete unit and the manufacturers say it requires no bolting or fastening on the inside of the furnace. A warning signal is also attached to the fuel hopper, warning the owner when the hopper is within six hours of being out of fuel.

The device is thermostatically controlled, so that theroetically the only attention it needs is the filling of the fuel hopper when the signal flashes. The fuel hopper holds 500 pounds of coal.

A small blower, operated by the motor which runs the screw feed, supplies draft to the Turner stoker.

The G. & M. Domestic

The G. & M. Domestic stoker, formerly known as the Electro-Matic, is manufactured by the Gray & Murdock Manufacturing Company, 1415 South State Street, Salt Lake City, Utah. This stoker is designed for use in any warm air furnace using not over 40 pounds of coal in any one hour, and the fuel hopper holds about 170 pounds of coal.

Regarding the type of fuel suitable for use in this stoker, the manufacturers say, "The G. & M. Stoker is designed to handle high volatile bituminous coal of sizes between 1¾ inches and ½-inch. Straight mine slack or yard screenings containing a considerable percentage of dust, are not suitable for this stoker. This stoker is not designed to burn coke, anthracite, or low volatile coals."

The stoker itself is of the overfeed type and sells retail at about $250. It is made in only one size, is mounted on a 2-inch pipe set in concrete in front of and at right or left of the furnace door so as to swing out of the way for cleaning the grate. The fuel feed and air jet are both introduced through the regular feed door of the furnace so that no special grate or retort are required, and no alteration to the furnace is necessary for installation.

A clock causes the stoker to feed coal for about five minutes every half hour to maintain the minimum fire. This keeps up the house temperature only in very mild weather. In colder weather, when the room temperature drops even a fraction of a degree below the point at which the thermostat is set, the thermostat causes the stoker to continue feeding coal beyond the five minute period for as long as is necessary to restore the normal temperature. This starting and stopping is entirely automatic, but manual control is also provided. The blower gives the fire a quick pick-up and practically smokeless combustion.

A very liberal dealer policy has been arranged for by the company.

That there is an urgent need for more efficient firing methods, which can only be had by automatic stoking, is readily understood when it is learned that in New York an analysis shows 2,200 tons of dirt in

(*Continued on Page* 18)

There is no reason why YOU can't swing the BIG Church — Factory — School heating contracts to WARM AIR

THIS article is headed "There is no reason," but I am compelled to state that there is a reason; a sorry one but true and it may be summed up in a few words; timidity of the dealer.

When the construction of any building larger than an eight-room house is under consideration, the local warm air dealer either passes it up entirely or hesitates, trembles, or stutters when he attempts to sell the building committee or the owner on the merits of a fan blast warm air heating and air conditioning system. Deep down in his own heart he may be convinced that such a system is needed, but he hesitates to approach the committee with his lack of information.

This much needed data is available from several sources. A little study and a visit to a few of the many successful installations will give him the confidence to talk convincingly and intelligently to his prospects. Where the installation is vast and complicated, he may avail himself of the services of engineers well versed and experienced in this type of work.

He must convince himself that schools, churches, theaters, garages, and factories need air conditioning and that the logical solution for their problem is the warm air fan blast system, and that he can handle the job.

The warm air furnace dealer is prone to place himself in the class of the merchandiser who has but to reach on the shelf for a staple food article, while in fact he must be a sanitation and ventilation engineer for his entire community. Responsibility for much of the health and sanitation in his territory falls directly at his door. Here, then, is an

Platte Overton says the live local man has the best opportunity to sell the Warm Air Heating and Ventilating idea against steam competition

opportunity of which he can and should avail himself.

He must determine to heat all of the buildings of this class in his territory. The financial loss incurred in the failure of ten attempts will be wiped out in the profits accruing from one successful installation. Go after the work and the old law of averages will take care of the profit. Every attempt to sell an installation will be an education and will help build confidence in the dealer and give him information that will be invaluable to him in future sales.

Talk air conditioning, sell it, think it. The progressive dealer should avail himself of every opportunity to learn more about this new and profitable branch of the industry.

These installations are not confined to new buildings. In every territory are public buildings with worn out or inadequate heating plants. The majority of them have no provision for air conditioning. Go after them. Refuse to plaster up old cracked fire pots, or run a new cold air. Sell them on the need of air conditioning. They pay $10,000 for a new organ, or spend $3,000 for decorations. Sell them a system that even the pastor will enjoy. They need it and are waiting for some one to convince them that they do.

Many communities are planning new schools. No school is too large to be heated and ventilated with the fan blast warm air system. The warm air dealer pays taxes to build these schools and should have an equal opportunity to figure the heating and ventilating system.

Garages in most cases are paying dividends to the casket manufacturers. Sell them air conditioning plants that will allow the average garage mechanic to live longer than the nine years now allotted to him.

Learn about the four important items in air conditioning: cleanliness, proper distribution of air, temperature and humidity control. They can only be maintained with the fan blast system. Start today.

Builders & Manufacturers Mutual to Carry Michigan Sheet Metal Men

At the recent meeting of the Michigan Sheet Metal and Roofing Contractors' Board of Directors it was determined to adopt the Builders and Manufacturers Mutual Casualty Company as the official compensation company for that association.

The "B & M" was organized several years ago for the sole purpose of serving the building industry of Michigan.

H. F. Voshardt, Pres., Friedley-Voshardt Co., Dies After Three Weeks' Illness

SHEET metal contractors all over the country will be shocked to learn of the sudden death of H. F. Voshardt, President and Treasurer of Friedley-Voshardt Company, 733 South Halsted Street, Chicago. Mr. Voshardt died at 4 a. m. May 28th.

About three weeks ago he was taken seriously ill in his office, at which time he suffered a stroke. Just previous to his death, however, he had recovered to such a degree that attending physicians thought the danger point had been passed. But he suffered a relapse and died before resuscitative measures could be applied.

Herman F. Voshardt was born in Two Rivers, Wisconsin, May 3rd, 1864. Coming to Chicago as a young man, he saw the opportunity for a chance to be of real service in the ornamental sheet metal business and engaged in that business with Albert Friedley, whom he met on a job on the State Capitol building of Texas, under the name of Friedley & Voshardt, in 1888, and their place of business was located at 763 Mather Street, Chicago, where they turned out sheet metal ornamental stampings of all kinds. In 1906 the business was incorporated and the present name adopted.

The partnership thus formed endured and prospered until the death of Mr. Friedley, which occurred in 1924, and was recorded in the August 30th issue of AMERICAN ARTISAN for that year. During the intervening time the address of the business was changed to 733 South Halsted Street, where the greatly increased activities of the company are now conducted.

Like Mr. Friedley, Mr. Voshardt enjoyed the friendship of a vast number of people and everyone who had the good fortune to do business with him soon learned to love him.

Mr. Voshardt was a bachelor until the death of his partner, when he married Mr. Friedley's widow. There were no children. Funeral services will be held at his home, 429 North Scoville Avenue, Oak Park, Illinois, and interment will be in the family Mausoleum at Two Rivers, Wisconsin. Services at Two Rivers were held on Friday of this week.

This family mausoleum was erected by Mr. Voshardt some years ago. It is one of the finest in that part of the country and is of a size sufficient to easily accommodate 16 bodies.

In the passing of Mr. Voshardt, as in the case of his partner, Mr. Friedley, not only the entire sheet metal industry, but all who knew him have lost a staunch and true friend. His all-consuming objective in life was service to his fellow man, and the high degree of success he attained in the pursuit of this aim is attested to by the thousands of friends and acquaintances who now mourn his loss.

Minneapolis-Honeywell Acquires Edgecomb Re-Issue Patent No. 15,531

Acquisition recently of the Edgecomb Re-issue Patent No. 15,531 by the Minneapolis-Honeywell Regulator Company will tend, it is believed, to clarify a situation which has more or less embarrassed the warm air heating industry.

The most important hook-ups in this connection are: first, a furnacestat which, when inserted in the furnace starts and stops the fan according to temperature changes. And, secondly, the room thermostat and motor in combination with the furnacestat, in which the motor controls the dampers and the furnacestat the action of the fan, according to casing temperatures.

The patent covers the hook-ups for gas and oil-burning units as well as coal burning.

In this connection also the same company announces the development of a new type C-2 furnacestat which is now in production which is similar to the new high voltage airstat. It is scaled from 0 to 600°F. with an approximate lag of 35° depending upon the rapidity of rising temperature.

"In the acquisition of the Edgecomb patent," states C. B. Sweatt, vice-president of the company, "we feel that we have rendered a distinct service to the warm air heating industry in general, as the former ownership of the patent caused a confusing status, not only to the manufacturer of furnace fans, but likewise to the manufacturer of warm air furnaces and the dealer.

"The resultant confusion and indecision was, we felt, definitely slowing down the progress of warm air heating. It was to clarify this situation and to utilize these patents for the benefits of our customers of the warm air heating industry that we purchased outright the Edgecombe Re-issue Patent No. 15,531.

"Our new type C-2 Furnacestat, adjustable to any temperature point, together with our line of damper controls, gives a complete combination of controls for forced warm air heating. The use of the complete line of Minneapolis-Honeywell controls will, of course, carry with it full protection under the above named patents.

"We believe," Mr. Sweatt continues, "that the entire industry will appreciate the solution of this problem and that it will materially hasten the general acceptance of forced warm air heating."

W. D. Cover Heads Scheible-Moncrief Heater Co.

W. D. Cover, has been made President of the Scheible-Moncrief Heater Company, 2545 East 79th Street, Cleveland, Ohio.

Mr. Cover succeeds O. L. Moon, President and Treasurer of the Company, who has not been in the best of health for quite some time, and it was thought that a change would be beneficial for him.

Mr. Cover has the best wishes of everyone in the trade in his new position.

WELDING DEVELOPMENT

(*Continued from Page* 11)

signer and inspector rather than upon the welder.

Failures of welded joints in service have been practically unknown for the following reasons: (1) Properly made welds are inherently strong. (2) In the application of Euler's formula for determining tube sizes for fuselage members, a coefficient of restraint of only 1 has been used; thus it has been assumed that the structure is pin-ended at every joint, although this is not the case. (3) The testing of new types of airplane construction has been very thorough. Nevertheless, procedure control as applied to aircraft welding has not yet been developed to the same extent as it has in other industrial fields. From the results obtained in other important fields it is certain that by the adoption of standardized procedure control methods much can be done toward better design and execution of the weld, increase of the strength-weight ratio, and a closer approach to the ideal of a plane that cannot be broken in the air. The procedure control prepared by The American Bureau of Welding and now being followed by the Bureau of Standards will, when finally revised, constitute an authoritative guide, available to all aircraft manufacturers on this important subject.

Check of Welder's Ability

A standard specification that will insure the hiring of good welders has been drawn up. This includes, in detail, previous experience or training required, specimen welds to be made, observation of the manner in which the prospective welder handles the apparatus and the factors of manual skill to be looked for by the welding inspector in a perliminary qualification test. Conformity to dimension, contour of the weld, penetration and fusion are taken into consideration. If the welder satisfactorily passes this preliminary test, he is required to pass a final qualification test consisting of certain rotative and position welds, which are then examined visually and subjected to prescribed strength and ductility tests. A welder having passed these tests is certain to be capable of making satisfactory aircraft welds.

Selection and Inspection of Material

Certain grades of mild-carbon and chrome-molybdenum steel, mentioned previously, are the materials used at present. The latter has largely replaced mild-carbon steel because of its superior strength, and due to its air-hardening properties, the strength of the welded tubing approaches that of the original material. Mild steel is still used to some extent. Its modulus of elasticity is equal to that of chrome-molybdenum steel, and it is cheaper.

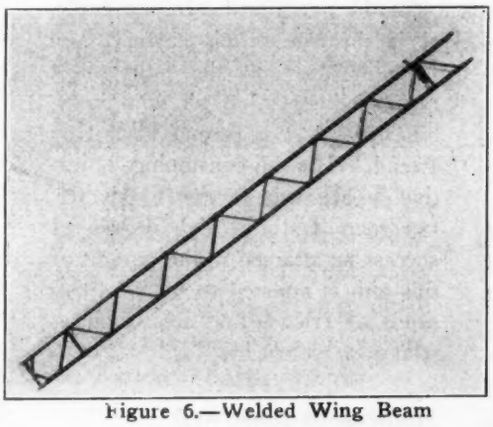


Figure 6.—Welded Wing Beam

Therefore, it is considered more economical for certain members by some manufacturers. Others have standardized on the alloy steel for all members.

The procedure control contains detailed specifications for check testing this material against mill specification for physical properties. Weldability tests are also prescribed for base metal and welding rod.

Design and Layout of Welded Joints

Design of welded joints is an extremely important consideration. While the joints used at present are very efficient, a standard design for each type of joint, which is strongest, easiest to weld, and most economical of base metal, welding rod and gases, and consequently lightest for the required strength, is highly desirable.

Position of tack welds and sequence of welding to avoid cracking and distortion of the members joined, from the contraction of the cooling weld metal, are problems yet to be thoroughly worked out. The principles of heat control are already well understood, especially for the simpler joints, but there is undoubtedly much room for improved procedure in the case of the more complicated joints containing gusset plates and fittings and where many members come together. Fig. 4 shows some joints of this general type.

Preparation for Welding

The actual layout or assembly of members is usually accomplished by the aid of jigs, although special or experimental work may be set up largely by means of clamps. Jig design is well understood at present although this too is susceptible of improvement and standardization. A jig for interchangeable-fuselage sections for large Army bombers is shown in Fig. 5. Probably the most important problem to be worked out in preparation for welding is the arrangement of work for line production. For instance, is it more economical to have six welders working simultaneously on one assembly or to have two welders working on each of three assemblies? Such details as this have not yet been satisfactorily determined, in most cases, due to the newness of the industry.

Actual manipulation of blowpipe and welding rod to secure a good weld needs little comment. A qualified welder, given detailed instructions, will experience no difficulty in properly executing the weld. Welding technique is, however, thoroughly covered in the procedure control.

Inspection and Test

An authoritative scheme for inspecting the work of the welder, which will insure against defective welds in the finished product, is also being worked out. Individual manufacturers have their own ideas on this subject and some of them are undoubtedly better than others. What is needed is a standard method that can be used successfully by any manufacturer. Methods of periodic testing of welders'

work and test of the finished product that will apply in all cases are included in the procedure control.

Individual welders are, as has been mentioned, required to pass qualification tests before undertaking production welding. Welding inspectors should be qualified by a period of training in a good welding laboratory. By this means they will obtain a laboratory point of view and a grasp of fundamental principles, obtainable in no other way, through contact with men extremely well versed in the theory and practice of welding as well as testing methods.

Additional items covered by the procedure control are welding apparatus and gases, characteristics of flame to be used, gaging welds and weld tightness as a possible means of preventing interior corrosion.

In the foregoing an effort has been made to set forth the lines along which present aircraft-welding practice may be improved. It is not possible to offer conclusions since the process of standardization is only now taking place.

Future Developments

Considerable heat-treating of welded airplane parts is now being done with marked success. J. B. Johnson, Chief, Materials Section, Army Air Service, Wright Field, Dayton, Ohio, in an article in *Airway Age* for December, 1928, mentions a type of welded joint used in fabricating airplane axles, which can be satisfactorily quenched and drawn without cracking, to develop a unit stress of 200,000 lb. per sq. in. Welded wing beams 20 ft. or more in length, Fig. 6, are being heat-treated in vertical furnaces and quenched vertically to prevent distortion, with resultant increase in strength. Heat treatment of entire welded fuselages, or sections of fuselages, may be a field for future development. It is doubtful, however, whether or not heat-treating can be applied advantageously to all structural parts because, although it materially improves tensile and compressive strength, it does not increase the modulus of elasticity of the steel and therefore the efficiency of the members.

Another future development may be the adoption of welding rod that will produce higher-strength welded metal than the low-carbon rod now in use. A welding rod known as High Test, developed by a large manufacturer of welding equipment and supplies, has met with marked success in other fields of steel welding. Welders can consistently make welds with it 11,000 lb. per sq. in. stronger in tension than those made with low carbon rod. It is thought that equivalent results may be obtained in aircraft practice. A higher strength weld metal would be of particular advantage in the case of heat-treated parts. Manufacturers so far have been hesitant to adopt alloy steel welding rods because they are not convinced that the same uniformity of results can be obtained as with the type of rod now used.

The welding industry is keenly alert to the possibilities for developing further improvements in welding as applied in aircraft construction. Its engineers, metallurgists and physicists are giving serious study to all phases of the subject. They invite cooperation of aviation executives by submitting their problems, in order that the same facilities and technical guidance may be applied to aircraft welding as have been adopted with such splendid results in other industries where procedure control has proved to be the key to successful production welding.

Louisville Women Compete for Prizes in Swimming

The Women's Auxiliary to the Sheet Metal Contractors' Association of Louisville, Kentucky, gave a swimming and dinner party, May 16th in honor of their President, Miss Georgia Merrick, at the Y. W. C. A. Prizes were awarded for the best swimmer to Miss Mary A. O'Leary and Mrs. George Goldner. The most popular, Miss Georgia Merrick, the most graceful, Miss Virginia Hutchison.

Theodore Vollertsen Heads New York State Salesmen's Auxiliary

A salesmen's auxiliary to the New York State Sheet Metal Contractors' Association has been formed, under the direction of Lee W. Gillespie, Secretary of the Ohio State Auxiliary.

The following officers were elected:

Theodore Vollertsen, President.

R. S. Elliot, Secretary and Treasurer.

L. B. Sherry, Chairman.

Directors:

F. O. Carfer, Buffalo.

Theodore Vollertsen, Syracuse.

John T. Stewart, New York City.

Lee W. Gillespie.

W. Roscoe Maher, Utica.

The Auxiliary adopted Constitution and By-Laws and adjourned subject to the call of the Officers and Directors to meet at the same time and place as the New York State Sheet Metal Contractors will meet in 1930.

1929 Wholesale Hardware Directory Issued

Volume 14, the 1929 edition of the American Wholesale Hardware Directory, is just off the press. It is published by Edward G. Baltz, 1701 Arch St., Philadelphia, Pa.

It comprises 116 pages, containing a list of 683 Shelf Hardware Jobbers of the United States and Canada, showing the lines of goods handled (56 classifications), names of buyers, etc.

473 Heavy Hardware Jobbers.

102 New York exporters who export hardware.

611 Department Stores who handle hardware or housewares.

253 Manufacturers' Agents in the United States.

The contents of the volume are arranged first by states alphabetically, and then by cities and towns in like order.

The book has been thoroughly revised in all departments; is considered standard in the trade, being the most accurate list of wholesale hardware houses published. Price is $2.50 a copy.

POINTED STAR DEVELOPMENT

(*Concluded from Page* 14)

1-2-3 and points 4-5, etc., are a direct reproduction of our former problem, only enlarged.

From x sweep the arc 4-5 and bisect the segment a-b, establishing point c. Take this distance a-c and set as b-d, which gives the new radius x-d for describing the circle. This establishes points 6-7-8, etc. This then allows for drawing the lines 2-6-1, 1-7-3, etc., and these will be the cutting lines for the star. To bend the hip and valley lines of this star, first bend all the hip lines, as 1-x, 2-x, 3-x, etc., over a sharp edge. Next bend the valley lines 6-x, 7-x, 8-x, etc., down to form the crease. Observe, some stretching is necessary in the valley lines to bring the shape up and remove the flatness, but when carefully done, the entire star can be made as accurately as if made in five pieces and soldered together.

Method Has Disadvantages

If, however, a greater depth of the star is desired than that provided in the stretching of the valley lines, then this method will not work satisfactorily. Thus, at "M" we have the height H-T we desire our star to have. Then H-1 and H-4 are the true lengths of hip and valley lines with which the pattern "N" is developed. Here line 1′-x′ is equal to H-1, and x′-4′-5′ is the same as H-4. If we should describe an arc 1′-d′ and a corresponding one of plan as 1-d, we see the spread d-e of plan is quite the same as d′-e′ of pattern "N." But on taking dividers and checking lines 1′-5′ of pattern with 1-7 of plan or the one piece pattern, we see a shortage in the base lines of the one piece pattern; that must be made up somewhere if it is to shape up properly.

So we can say the one piece pattern is ideal for shallow stars, but where a greater depth in center is desired, then it is better to revert back to the five-piece pattern. Such stars can be made any size desired; the proportions of the pentagon will always hold the star to a proper ratio of proportion.

Detailing 12-Pointed Star

Now many tradesmen are interested in a 12-pointed star, having heard someone talk about it. So above Fig. 13 we show this ornament and we see it is based on the five pointed star. This is nothing more than pentagonal pyramids planted together at the base, so that the sides fit together and close the opening. There will then be 10 pyramids pointing outward as 1-2-3-4-5 and the center one 6 on each end, making 12 altogether.

The vertical distance 1-V is the altitude of each pyramid while Z-Y is the hip line. Set these lengths in diagram "R" where h-t is the height, and t-y is the base of plan, so h-y will be the true length to use in describing the pattern using Z′ as center. On this arc we lay off five sides of the base of central pyramid in plan and draw lines as shown.

Edges on such work are seldom allowed, as the edges are butted together and soldered. In assembling the points into the 12-pointed star care should be taken to maintain the angle 1-Y-2 between all sides, otherwise some trouble may be experienced in bringing the several edges together perfectly.

Such items made of polished zinc, copper, brass or sheet lead will last indefinitely out-of-doors, and it is a piece of work any workman can be proud of.

A drawing such as we show produces accuracy and neatness in both home work and in the daily work. But we all know that a man who is neat, accurate and full of pride in his home drawing work, is also interested in the same measure at the shop, and that helps lift him up.

New Sales Plan Perfected by Henry Furnace & Foundry Co.

The Henry Furnace & Foundry Company, 3471 East 49th Street, Cleveland, Ohio, makers of the Moncrief furnace, have recently perfected a new selling campaign designed to assist the warm air furnace installer in convincing the entire family of the merits of warm air heat.

In describing this new sales plan the company has had prepared two very attractive folders, one showing how to appeal to the various members of the family—pa, ma, sister Sue and Jack—and the other outlining ten points of merit of the new Series C Moncrief furnace.

In addition there are two smaller folders dealing with specific points about the furnaces manufactured by the company which are of interest to the furnace installer and can be used by him to bolster up his main selling talk once he has gained an audience.

A third and still smaller booklet takes the furnace apart and shows the manner of construction, making abundant use of illustrations for quick comprehension.

This plan is very well conceived and has all the earmarks of being of unusual interest to furnace installers. A copy for your perusal will be sent upon written request to the company. Write for it.

Big Golf Tournament Begins for Michigan Sheet Metalers

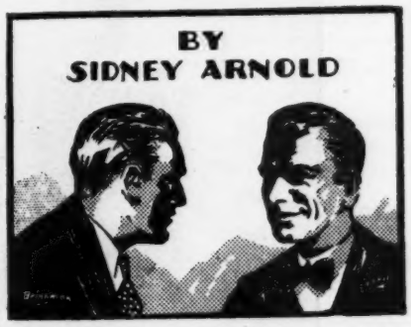
Bill Rettenmeir, Chairman of the Golf Committee of the Michigan Sheet Metal and Roofing Contractors in Detroit, announced last week that "Without a doubt the tournament would start Thursday, May 23." Because of so much activity it has been necessary to postpone the opening date several times and for this reason Bill made his announcement as he did.

Bill Busch, President of the Detroit Association, extended an invitation to all members of the State Association to be guests at this affair and more than ten acceptances from members outside of Detroit had been received.

Several prizes have been donated by manufacturers.

Anyone from outside of Detroit planning to attend later meetings should write to Bill Busch so that he can make necessary arrangements.

RANDOM NOTES AND SKETCHES



Rockford, Ill., May 28, 1929.

Here's a letter from James Charles Allen:

I can account for E. B. Lagenberg being in Chicago last week with Allen Williams.

You perhaps know that St. Louis, Lagenberg's home, has a most wonderful display of shrubbery in "show gardens." It is claimed that any shrub in the world "that will grow in the U. S. is there."

Well E. B. is quite a horticulturist. It was perhaps Williams' kindness of heart to meet him half way is reason they came to the windy city.

Williams also is interested in horticulture or horse culture. E. B. wrote him a letter relative to a new shrub or bust. Allen was immediately interested, hence the trip to Chicago.

Lagenberg in his letter told Williams he wished that he could arrange a meeting in Chicago as he had and would bring a rare variety that he had in his cellar off the "An-houser Bush." Allen came.

Sid: This is strictly confidential and only to be used in your quiet journal.

* * *

A policeman brought in a negro woman. The desk sergeant scowled and roared at her:

"Liza, you've been brought in for intoxication."

"Dat's fine!" beamed Liza. "Boy, you can start right now!"

* * *

My friend, John B. Fehlig, has reason to believe that belated recognition for faithful services is better than none at all. You see, John was the trusted treasurer of the Western Warm Air Furnace and Supply Association until that hot bed for the germination of fertile ideas for the betterment of the warm air heating industry was consolidated with the National Warm Air Heating Association.

It all happened this way. On May 25th H. W. Symonds, pursuant to instructions from the last existing Board of Directors of the Western, presented Mr. Fehlig with a silver loving cup, with the following inscription: "Presented to John B. Fehlig as a Token in Recognition of Faithful Service as Our Only Treasurer from February 5, 1919, to June 22, 1928. The Western Warm Air Furnace and Supply Association of the Past."

John Fehlig's Loving Cup

Well, now that certainly is fine. If there is any one man who is deserving of a thing like that it is Mr. Fehlig.

* * *

Mrs. Albert J. Wagner, Chicago: "I always allow my husband to sit in an easy chair and put his feet on the radiator."

Mrs. Hans Staar, Chicago: "Why?"

Mrs. Wagner: "I have sometimes found as much as four dollars in change on the floor the next day."

* * *

I know that W. F. Angermyer, Pittsburgh, is going to enjoy this one:

St. Peter was interviewing the fair damsel at the pearly gate.

"Did you, while on earth," he asked, "indulge in necking, petting, smoking, drinking or dancing?"

"Never!" she retorted emphatically.

"Then why haven't you reported sooner?" said St. Peter. "You've been dead a long time!"

* * *

Louder—and Funnier

Some people wonder what a Mormon wedding ceremony is like. Perhaps it goes something like this:

Parson (to groom): "Do you take these women to be your lawfully wedded wives?"

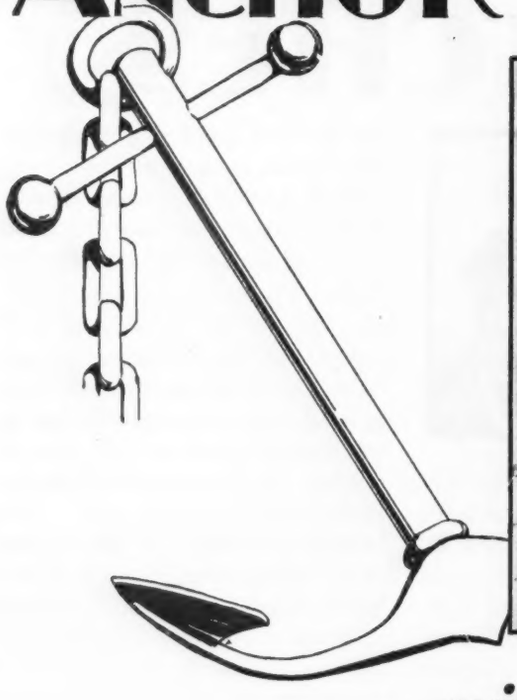
Groom: "I do."

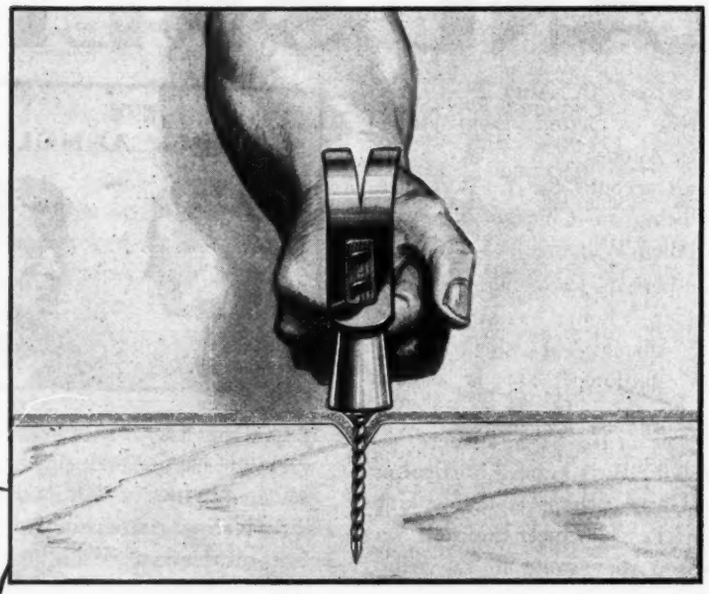
Parson (to brides): "Do you take this man to be your lawfully wedded husband?"

Brides: "We do."

Parson: "Some of you girls in the back of the room will have to speak a little louder if you want to be included in this."

ANCHOR *sheet metal to wood*





..with Hardened Screwnails!

Tests prove that Hardened Screwnails have over 4 times the holding power of ordinary nails.

As the Hardened Screwnail is hammered in, its needle-pointed pilot forms a burr in the sheet metal. And the hardened spiral thread cuts into the burr and into the wood, securely anchoring the sheet metal to the wood.

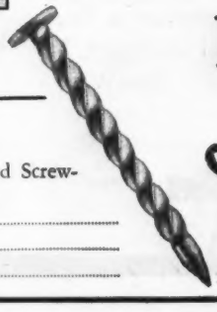
Screwnails will not loosen, back out or pull out. And they are so hardened that they do not bend or break off.

Screwnails can be used to advantage by sheet metal workers, roofers, fireproof window and door manufacturers, automobile manufacturers and body builders, railroads, sign makers, refrigerator manufacturers and others who fasten sheet metal to wood.

Check up the advantages of using Screwnails on your work. The coupon brings samples for trial—free.

No need to punch a hole... sharp needle point pierces sheet metal with ease.

Hardened spiral thread forms a thread in the sheet metal and wood as you drive it in.



PARKER-KALON CORPORATION,
190 Varick Street, New York.

Please send me a handful of Hardened Screwnails. I want to try them out for

.....

Name.....

Address.....

PARKER-KALON
HARDENED
*Screw*nails

PATENTED JAN. 29, 1924-No. 1482151
OTHER PATENTS PENDING

PARKER-KALON CORPORATION
190 VARICK STREET NEW YORK

Chicago Warehouse Metal and Furnace Supply Prices

AMERICAN ARTISAN is the only publication containing Western Metal, Furnace Supply and Hardware prices corrected weekly

METALS

PIG IRON

Chicago Fdy., No. 2	$20 00
Southern Fdy. No. 2	21 51
Lake Superior Charcoal	27 04
Malleable	20 00

FIRST QUALITY BRIGHT CHARCOAL TIN PLATES

IC	20x28 112 sheets	$23 50
IX	20x28	26 50
IXX	20x28 56 sheets	14 50
IXXX	20x28	15 50
IXXXX	20x28	17 00

TERNE PLATES

		Per Box
IC	20x28, 40-lb. 112 sheets	$26 70
IX	20x28, 40-lb. 112 sheets	29 70
IC	20x28, 25-lb. 112 sheets	22 20
IX	20x28, 25-lb. 112 sheets	25 20
IC	20x28, 20-lb. 112 sheets	20 25
IV	20x28, 20-lb. 112 sheets	23 00

"ARMCO" INGOT IRON PLATES

No. 8 ga.—100 lbs.	$4 15
3/16 in.—100 lbs.	4 05
¼ in.—100 lbs.	3 85

COKE PLATES

Cokes, 80 lbs., base, 20x28	$12 00
Cokes, 90 lbs., base, 20x28	12 20
Cokes, 100 lbs., base, 20x28	12 40
Cokes, 107 lbs., base, IC 20x28	12 75
Cokes, 135 lbs., base, IX 20x28	14 75
Cokes, 155 lbs., base, 2X, 56 sheets	8 50
Cokes, 175 lbs., base 3X, 56 sheets	9 35
Cokes, 195 lbs., base 4X, 56 sheets	10 25

BLUE ANNEALED SHEETS

Base 10 ga. per 100 lbs.	$3 35
"Armco" 10 ga. per 100 lbs.	4 15

ONE PASS COLD ROLLED BLACK

No. 18-20 per 100 lbs.	$3 85
No. 22 per 100 lbs.	4 00
No. 24 per 100 lbs.	4 05
No. 26 per 100 lbs.	4 15
No. 27 per 100 lbs.	4 20
No. 28 per 100 lbs.	4 30
No. 29 per 100 lbs.	4 45
No. 30 per 100 lbs.	4 55

"ARMCO" GALVANIZED

"Armco" 24 per 100 lbs.	$6 15

GALVANIZED

No. 16 per 100 lbs.	$4 40
No. 18 per 100 lbs.	4 55
No. 20 per 100 lbs.	4 70
No. 22 per 100 lbs.	4 75
No. 24 per 100 lbs.	4 90
No. 26 per 100 lbs.	5 15
No. 27 per 100 lbs.	5 25
No. 28 per 100 lbs.	5 40
No. 30 per 100 lbs.	5 80

BAR SOLDER

Warranted 50-50 per 100 lbs.	$31 25
48-52 per 100 lbs.	30 50
45-55 per 100 lbs.	29 25
Plumbers' per 100 lbs.	27 25

ZINC

In Slabs	$ 7 35

SHEET ZINC

Cask Lots (600 lbs.)	$11 75
Sheet Lots	12 75

BRASS

Sheets, Chicago base	24½c
Mill base	23½c
Tubing, brazed, Chicago base	31½c
Mill base	30½c
Tubing, seamless, Chicago base	29½c
Mill base	28½c
Wire, Chicago base	24½c
Mill base	23½c
Rods, Chicago base	22½c
Mill base	21½c

COPPER

Sheets, Chicago base	27½c
Mill base	26½c
Tubing, seamless, Chicago base	30½c
Mill base	29½c
Wire, plain rd., 8 B. & S. Ga. and heavier	25½c

LEAD

American Pig	$7 85
Bar	8 85

TIN

Bar Tin per 100 lbs.	$50 00
Pig Tin per 100 lbs.	49 00

HARDWARE, SHEET METAL SUPPLIES, WARM AIR FURNACE FITTINGS AND ACCESSORIES.

ASBESTOS

Paper up to 1/16	6c per lb.
Roll board	7½c per lb.
Mill board 3/32 to ½	7½c per lb.
Corrugated Paper (350 sq. ft. to roll)	$6 00 per roll

BRUSHES

Furnace Pipe Cleaning Bristle with handle each	$0 75
Flue Cleaning Steel only, each	1 25

CEMENT, FURNACE

American Seal, 5-lb. cans, net	$ 45
American Seal, 10-lb. cans, net	85
American Seal, 25-lb. cans, net	2 25
Pecora per 100 lbs.	7 50

CHIMNEY TOPS

Adams' Revolving

	Wt. Doz.	Price Doz.
4 in.	21 lbs.	$11 00
6 in.	24 lbs.	11 50
7 in.	30 lbs.	13 50
8 in.	33 lbs.	15 00
9 in.	51 lbs.	16 50
10 in.	56 lbs.	18 00
12 in.	66 lbs.	22 00
14 in.	110 lbs.	36 00

CLINKER TONGS

Each	$1 50

CLIPS

Damper No-Rivet Steel, with tail pieces, per gross	$9 50
Rivet Steel, with tail pieces, per gross	7 50
Tail pieces, per gross	2 40

COPPERS—Soldering Pointed Roofing

3 lb. and heavier	per lb. 40c
2½ lb.	per lb. 45c
2 lb.	per lb. 48c
1½ lb.	per lb. 55c
1 lb.	per lb. 60c

CORNICE BRAKES

Chicago Steel Bending Nos. 1 to 6B	Net

CUT-OFFS

Gal., plain, round or cor. rd.

26 gauge	30%
28 gauge	35%

DAMPERS

Yankee Hot Air

7 Inch, doz.	$1 60
8 inch, doz.	2 20
9 inch, doz.	2 60
10 inch, doz.	2 80
12 inch, doz.	3 50
14 inch, doz.	5 00

ADAMS No. 1 CHECK

Check and Collar Complete

8 inch, each	2 00
9 inch, each	2 25

End Check Only

8 inch, each	1 60
9 inch, each	1 85

Collar Only

8 inch, each	50
9 inch, each	65

No. 2 CHECK

8 inch, each	1 00
9 inch, each	1 00

10% Disc. on Adams No. 1 and No. 2 Check

Diamond Smoke Pipe

7 inch, doz.	$2 00
8 inch, doz.	2 20
9 inch, doz.	4 80
10 inch, doz.	6 00

Adams' Sheet Metal

7 inch, doz.	$1 60
8 inch, doz.	2 20
9 inch, doz.	2 60
10 inch, doz.	2 80
12 inch, doz.	3 50
14 inch, doz.	5 00

EAVES TROUGH

Galv. Crimpedge, crated	75-10%
Zinc, "Barnes"	60%

ELBOWS

Conductor Pipe

Galv. plain or corrugated, round flat Crimp,

28 Gauge	60%
26 Gauge	45%
24 Gauge	15%

Galv. Terne Steel

Plain Rd. and Rd. Corr.:

28 Ga.	60%
26 Ga.	45%
24 Ga.	15%

Square Corrugated

No. 28 Gauge	50%
26 Gauge	35%

Portico Elbows

Standard Gauge Conductor Pipe, plain or corrugated.

Not nested	70 & 5%
Nested Solid	70 & 5%

Sq. Corr., A. & B. & Octagon

28 Ga.	50%
26 Ga.	35%

Portico

1", 1¼", 1½" 45%

Copper

16 oz., all designs 40%

Zinc—

All styles 60%

ELBOWS—Stove Pipe

1-piece Corrugated. Uniform Blue "Milcor" No. 28 Gauge.	Doz.
5-inch	$1 15
6-inch	1 25
7-inch	1 75

Special Corrugated

6-inch	$1 60
7-inch	1 60

Adjustable—Uniform Blue

"Milcor" No. 28 Gauge. Uniform Blue.

5-inch	$1 60
6-inch	1 75
7-inch	2 10

WOOD FACES—60% off list.

FENCE

726-6-12½% (100 rods)	$28 68
1948-6-14½% (100 rods)	43 62

FILES AND RASPS

Heller's (American)	50-10%
American	60-10%
Arcade	50%
Black Diamond	50%
Eagle	50%
Great Western	50%
Kearney & Foot	50%
McClellan	50%
Nicholson	50%
Simonds	60%

FIRE POTS

Geo. W. Diener Mfg. Co.	Eq.
No. 02 Gasoline Torch, 1 qt.	$ 5 13
No. 9250, Kerosene, or Gasoline Torch, 1 qt.	6 50
No. 10 Tinner's Furn. Square tank, 1 gal.	11 20
No. 15 Tinner's Furn. Round tank, 1 gal.	10 70
No. 21 Gas Soldering Furnace	3 60
No. 110 Automatic Gas Soldering Furnace	10 50

GALVANIZED WARE

Pails (Galv. after made), 10-qt.	$3 60
Tubs (Galv. after made). No. 1	5 75
No. 2	6 50

GLASS

Single Strength, A, all brackets	85%
Single Strength, B, all brackets	87%
Double Strength, A, all brackets	85%
Double Strength, B, all brackets	87%

HANGERS

Conductor Pipe

Milcor Perfection Wire	35%
Milcor Triplex Wire	10%

Eaves Trough

Milcor Steel (galv. after forming) from List	50%
Milcor Seidlock B. T. Wire, List	10%

HOOKS

Conductor

"Direct Drive" Wrought Iron for wood or brick 15%

HUMIDIFIER

"Front-Rank," Automatic

In single lots	50%
In lots of 10 or more	50-5%
In lots of 25 or more	50-10%
Vapor pans, etc., each	50%

LIFTERS

Stove Cover

Coppered per gro.	$6 00
Alaska per gro.	4 75

MALLETS

Tinners

Hickory per doz.	$2 35

MITRES

Galvanized steel mitres

28 Ga.	70
26 Ga.	60-30

NAILS

Cut Steel, base	$4 90

Wire

Common	$3 10
Cement Coated	3 15

(Continued on page 32)

ADVERTISERS' INDEX

The dash (—) indicates that the advertisement runs on a regular schedule but does not appear in this issue.

Markets--Continued from Page 31

PASTE

Asbestos Dry Paste:

200-lb. barrel	$14 00
100-lb. barrel	7 50
50-lb. pail	4 25
10-lb. bag	1 00
5-lb. bag	55
2½-lb. cartons	25

POKERS, FURNACE

Each $0 75

POKERS, STOVE

Nickel Plated, coil handles, per doz. 1 10
W'r't Steel, str't or bent, per doz. $0 75

PIPE

Conductor
Cor. Rd., Plain Rd., or Sq.

Galvanized
Crated and nested (all gauges) 75-7½%
Crated and not nested (all gauges) 75-2½%

Furnace Pipe
Double Wall Pipe and Fittings .....50 & 10%
Single Wall Pipe, Round Galvanized Pipe ....50 & 10%
Galvanized and Tin Fittings .....50 & 10%

Lead
Per 100 lbs. $12 50

Stove Pipe
"Milcor" "Titelock" Uniform Blue Stove

28 gauge, 5 inch U. C. nested	11 00
28 gauge, 6 inch U. C. nested	12 00
28 gauge, 7 inch U. C. nested	14 00
30 gauge, 5 inch U. C. nested	10 25
30 gauge, 6 inch U. C. nested	11 00
30 gauge, 7 inch U. C. nested	13 00

T-Joint Made up
6-inch, 28 ga....per doz. $ 3 40
All Zinc
No. 11, all styles 60%

PULLEYS

Furnace Tackle....per doz. $0 85
.....per gro. 8 50
Furnace Screw (enameled) .....per doz. 75

PUTTY

Commercial Putty, 100-lb. Kits $3 50

QUADRANTS

Malleable Iron Damper.....10%

REDUCERS—Oval Stove Pipe

	Per Doz.
7—6, 28-gauge, 1 doz. in carton	$2 00

REGISTERS AND BORDERS

Baseboard, Floor and Wall

Cast Iron 20%
Steel and Semi-Steel 33⅓%
Baseboard, 1 piece 33⅓-20%
Baseboard, 2 piece 33⅓%
Wall 33⅓%
Adjustable Ceiling Ventilators 33⅓%

Register Faces—Cast and Steel
Japanned, Bronzed and Plated, 4x6 to 14x14.....33⅓%
Large Register Faces—Cast, 14x14 to 38x42 .....50%
Large Register Faces—Steel, 14x14 to 38x42 .....60%

Ventilating Register

Per gross	9 00
Small, per pair	10
Large, per pair	50

RIDGE ROLL

Galv., Plain Ridge Roll, b'did .....75-15-5?
Galv., Plain Ridge Roll crated 75-15

SCREWS

Sheet Metal
7, ½x⅛, per gross .....$0 5?
No. 10, ⅝x3/16, per gross 6?
No. 14, ⅞x¼, per gross.. 8?

SHEARS, TINNERS' & MACHINISTS'

Viking .....$22 0?

Lennox Throatless
No. 18 .....35%
Shear blades 10%
(f. o. b. Marshalltown, Iowa)

SHIELDS, ADJUSTABLE RADIATOR

No. 1 "Gem" 11" to 17"....30%
No. 2 "Gem" 14" to 24"....30%
No. 3 "Gem" 35" to 65"....30%

SHOES

Galv. 28 Gauge, Plain or corrugated round flat crimp..60%
26 gauge round flat crimp..45%
24 gauge round flat crimp..15%

SNIPS, TINNERS

Clover Leaf .....40 & 10%
National .....40 & 10%
Star 50%
Milcor .....Net

SQUARES

Steel and Iron .....Net
(Add for bluing $3 per doz. net)
Mitre .....Net
Try .....Net
Try and Bevel .....Net
Try and Mitre .....Net
Fox's .....per doz. $6 00
Winterbottom's 10%

STOPPERS, FLUE

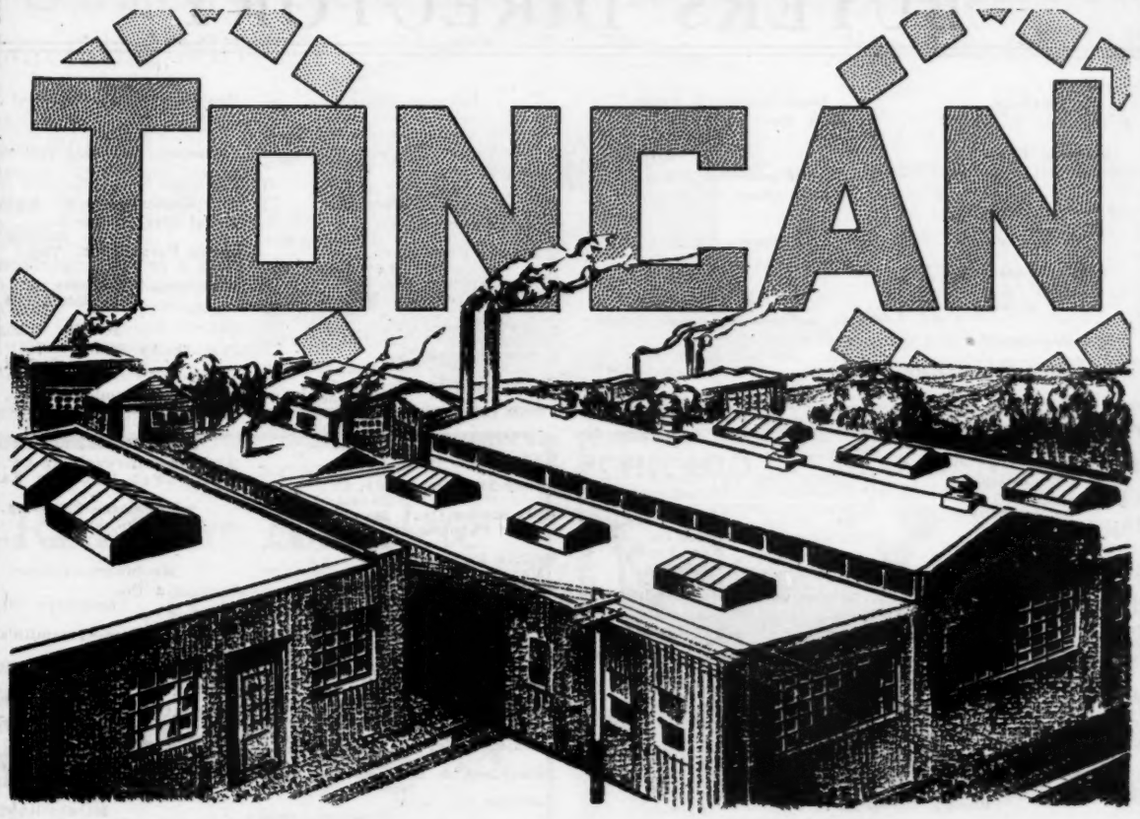
Common .....per doz. $1 10
Gem, No. 1 .....per doz. 1 10
Gem, flat, No. 3....per doz. 1 00

VENTILATORS

Standard .....30 to 40%

WIRE

Black annealed wire, No. 9, per 100 lbs. $3 30
Galvanized barb wire, per 100 lbs. 3 90
Cattle Wire—galvanized catch weight spool, per 100 lbs.. 3 80
Galvanized Plain Wire, No. 9, per 100 lbs. ..... 3 2?



Defeat Corrosion *with rust-resisting* TONCAN

CONSTANT exposure—rain and snow—quickly deteriorate the average sheet iron. Rust and corrosion set in and soon an expensive product is rendered practically useless · · · a building must be reroofed · · · pipes removed.

So often a needless expense—avoidable if Toncan Copper Mo-lyb-den-um Iron is used. For this pure iron, scientifically alloyed with pure copper and molybdenum is many times more resistant to rust and corrosion—far more durable, than any other ferrous metal.

Toncan Iron can be used for roofing, smoke stacks, pipes, boilers, heating and ventilating systems, cornices, canopies, culverts, railway cars and hundreds of other things wherever protection against rust is needed.

If you do not know about this remarkable metal let us send you our free booklet fully explaining Toncan and all its uses. Write us today.

CENTRAL ALLOY STEEL CORPORATION

Massillon and Canton, Ohio

WORLD'S LARGEST AND MOST HIGHLY SPECIALIZED ALLOY STEEL PRODUCERS

REG. U.S. PAT. OFF.
TONCAN
COPPER
Mo-lyb-den-um
IRON

BUYERS' DIRECTORY

Air Cleaners.
Meyer & Bro. Co., F., Peoria, Ill.

Asbestos Paper.
Sall-Mountain Co., Chicago, Ill.

Asbestos Liquid.
B. & F. Mfg. Co., Des Moines, Iowa

Ball Joints.
Alfred C. Goethal Co., Milwaukee, Wis.

Benches—Steel.
Maplewood Machinery Co., Chicago, Ill.

Blast Gates.
Alfred C. Goethal Co., Milwaukee, Wis.

Blow Pipe Fittings.
Alfred C. Goethal Co., Milwaukee. Wis.

Bolts—Stove.
The Kirk-Latty Co., Cleveland, Ohio
Lamson & Sessions Co., Cleveland, Ohio
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Brakes—Bending.
Dreis & Krump Mfg. Co., Chicago, Ill.
Ryerson & Son., Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Brakes—Cornice.
Dreis & Krump Mfg. Co., Chicago, Ill.

Brass and Copper.
American Brass Co., Waterbury, Conn.
Copper & Brass Research Association, New York

Cans—Garbage.
Osborn Co., The J. M. & L. A., Cleveland, Ohio

Castings—Malleable.
Fanner Mfg. Co., Cleveland, Ohio

Ceilings—Metal.
Eller Manufacturing Co., Canton, Ohio
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Chaplets.
Fanner Mfg. Co., Cleveland, Ohio

Chimney Tops.
Standard Ventilator Co., Lewisburg, Pa.

Cleaners—Vacuum.
Brillion Furnace Co., Brillion, Wis.
Gottschalk Heating Co., Covington, Ky.
National Super Service Co., Toledo, Ohio

Copper.
American Brass Co., Waterbury, Conn.
Copper & Brass Research Association, New York

Cornices.
Eller Manufacturing Co., Canton, Ohio
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Cut-offs—Rain Water.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Dampers—Quadrants—Accessories.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City
Parker-Kalon Corp., New York, N. Y.

Damper Regulators.
National Regulator Co., Chicago, Ill.
H. M. Sheer Co. Quincy, Ill.

Dies—Punch & Press.
La Salle Machine Works, Chicago, Ill.

Diffuser—Air Duct.
Aeolus-Dickinson Co., Chicago, Ill.

Doors—Metal.
Lupton's Sons Co., David, Philadelphia, Pa.

Drive Screws—Hardened Metallic.
Parker-Kalon Corp., 200 Varick St., New York

Eaves Trough.
Barnes Metal Products Co., Chicago, Ill.
Berger Bros. Co., Philadelphia, Pa.
Lupton's Sons Co., David, Philadelphia, Pa.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City
New Jersey Zinc Sales Co., The, New York, N. Y.

Elbows and Shoes—Conductor.
Barnes Metal Products Co., Chicago, Ill.
Dieckmann Co., Ferdinand, Cincinnati, Ohio
Lupton's Sons Co., David, Philadelphia, Pa.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Wood Faces—Warm Air.
Auer Register Co., Cleveland, Ohio
American Wood Register Co., Plymouth, Ind.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Fittings—Conductor.
Barnes Metal Products Co., Chicago, Ill.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Flanges.
Chicago Metal Mfg. Co., Chicago, Ill.

Fittings—Steel Pipe.
Chicago Metal Mfg. Co., Chicago, Ill.

Flue Thimbles.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Furnace Cement—Asbestos.
Connors Paint Mfg. Co., Wm., Troy, N. Y.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Furnace Cement—Liquid.
Technical Products Co., Pittsburgh, Pa.

Furnace Cleaners—Suction.
Brillion Furnace Co., Brillion, Wis.
Gottschalk Heating Co., Covington, Ky.
National Super Service Co., Toledo, Ohio

Furnace Fans.
A-C Mfg. Co., Pontiac, Ill.
Canton Furnace & Mfg. Co., Canton, Ohio
A. H. Robinson Co., Massillon, Ohio
Warm Air Furnace Fan Co., The, Cleveland, Ohio

Furnace Fuse.
National Regulator Co., Chicago, Ill.

Furnace Regulators.
National Regulator Co., Chicago, Ill.
H. M. Sheer Co., Quincy, Ill.

Furnace Rings.
Forest City-Walworth Run Foundries Co., Cleveland, Ohio
Milwaukee Corrugating Co., Milwaukee, Wis.

Furnaces—Warm Air.
Agricola Furnace Co., Gadsden, Ala.
American Furnace Co., St. Louis, Mo.
Brillion Furnace Co., Brillion, Wis.
Canton Furnace & Mfg. Co., Canton, Ohio
Colburn Heater Co., Chicago, Ill.
Emrich Co., C., Columbus, Ohio
Farris Furnace Co., Springfield, Ill.
Floral City Heater Co., Monroe, Mich.
Forest City-Walworth Run Fdy., Cleveland, Ohio
Fox Furnace Co., Elyria, Ohio
Hall-Neal Furnace Co., Indianapolis, Ind.
Henry Furnace & Fdy. Co., Cleveland, Ohio
Hess-Snyder Co., Massillon, Ohio
Homer Furnace Co., Coldwater, Mich.
Lennox Furnace Co., Marshalltown, Ia.; Syracuse, N. Y.
Magirl Foundry & Furnace Co., P. H., Bloomington, Ill.
May Fiebeger Furnace Co., Newark, Ohio
Marshall Furnace Co., Marshall, Mich.
Meyer Furnace Co., The, Peoria, Ill.
Midland Furance Co., Columbus, Ohio
Mt. Vernon Furnace & Mfg. Co., Mt. Vernon, Ill.
Premier Warm Air Heater Co., Dowagiac, Mich.
Richardson & Boynton Co., New York, N. Y.
Robinson Co., A. H., Massillon, Ohio
Success Heater Mfg. Co., Des Moines, Ia.
XXth Century Heating & Ventilating Co., Akron, Ohio
Waterman-Waterbury Co., Minneapolis, Minn.
Western Steel Products Co., Duluth, Minn.
Wise Furnace Co., Akron, Ohio

Glass—Wire.
Lupton's Sons Co., David, Philadelphia, Pa.

Grilles.
Auer Register Co., Cleveland, Ohio
Harrington & King Perforating Co., Chicago, Ill.
Hart & Cooley Co., New Britain, Conn.
Tuttle & Bailey Mfg. Co., Chicago, Ill.

Grilles—Stove Front.
Tuttle & Bailey Mfg. Co., Chicago, Ill.

Guards—Machine and Belt.
Harrington & King Perforating Co., Chicago, Ill.
Nortmann-Duffke Co., Milwaukee, Wis.

Handles—Boiler
Berger Bros. Co., Philadelphia, Pa.

Handles—Soldering Iron.
Hyro Mfg. Co., New York, N. Y.

Hangers—Eaves Trough.
Berger Co., L. D., Philadelphia, Pa.
Horan Stay Hanger Co., Louisville, Ky.
Lupton's Sons Co., David, Philadelphia, Pa.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Heat Regulation Systems.
National Regulator Co., Chicago, Ill.
H. M. Sheer Co., Quincy, Ill.

Heaters—Cabinet
Fox Furnace Co., Elyria, Ohio
Waterman-Waterbury Co., Minneapolis, Minn.

Heaters—Combination Hot Water.
Alamo Heater Co., Chicago, Ill.

Heaters—Domestic Hot Water.
Alamo Heater Co., Chicago, Ill.

Heaters—School Room.
Floral City Heater Co., Monroe, Mich.
Meyer Furnace Co., The, Peoria, Ill.
Waterman-Waterbury Co., Minneapolis, Minn.

Hotels.
Fort Shelby Hotel, Detroit, Mich.

Humidifiers.
Meyer & Bro. Co., F., Peoria, Ill.

Lath—Expanding Metal.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Machines—Crimping.
Bertsch & Co., Cambridge City, Ind.

Machinery—Culvert.
Bertsch & Co., Cambridge City, Ind.

Machines—Tinsmith's.
Bertsch & Co., Cambridge City, Ind.
Dreis & Krump Mfg. Co., Chicago, Ill.
Interstate Machinery Co., Chicago, Ill.
La Salle Machine Works, Chicago, Ill.
Maplewood Machinery Co., Chicago, Ill.
Marshalltown Mfg. Co., Marshalltown, Iowa
Osborn Co., The J. M. & L. A., Cleveland, Ohio
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.
Hyro Mfg. Co., New York, N. Y.

Metals—Perforated.
Harrington & King Perforating Co., Chicago, Ill.
Nortmann-Duffke Co., Milwaukee, Wis.

Miters.
Braden Mfg. Co., Terre Haute, Ind.
Friedley-Voshardt Co., Chicago, Ill.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Miters—Eaves Trough.
Barnes Metal Products Co., Chicago, Ill.
Lupton's Sons Co., David, Philadelphia, Pa.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Nails—Hardened Masonry.
Parker-Kalon Corp., New York, N. Y.

Oil Burners.
McIlvaine Burner Corp., Evanston, Ill.
Northern Oil Burner Co., Minneapolis, Minn.
Preferred Oil Burners, Inc., Peoria, Ill.

Ornaments—Sheet Metal.
Friedley-Voshardt Co., Chicago, Ill.
Gerock Bros. Mfg. Co., St. Louis, Mo.
Miller & Doing, Inc., Brooklyn, N. Y.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Paint.
Connors Paint Mfg. Co., Wm., Troy, N. Y.

Patterns—Furnace and Stove.
Cleveland Castings Pattern Co., Cleveland, Ohio
Quincy Pattern Co., Quincy, Ill.
Vedder Pattern Works, Troy, N. Y.

(Continued on page 36)

BUYERS' DIRECTORY

(Continued from page 34)

Perforated Metals.
Harrington & King Perforating Co., Chicago, Ill.
Nortmann-Duffke Co., Milwaukee, Wis.

Pipe and Fittings—Furnace.
Chicago Furnace Supply Co., Chicago, Ill.
Henry Furnace & Fdy. Co., Cleveland, Ohio
Lamneck Co., W. E., Columbus, Ohio
Meyer & Bro. Co., F., Peoria, Ill.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City
Osborn Co., The J. M. & L. A., Cleveland, Ohio

Pipe and Fittings—Stove.
Meyer & Bro. Co., F., Peoria, Ill.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Pipe—Conductor.
Barnes Metal Products Co., Chicago, Ill.
Berger Bros. Co., Philadelphia, Pa.
Chicago Metal Mfg. Co., Chicago, Ill.
Dieckmann Co., Ferdinand, Cincinnati, Ohio
Friedley-Voshardt Co., Chicago, Ill.
Lupton's Sons Co., David, Philadelphia, Pa.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City
New Jersey Zinc Sales Co., The New York, N. Y.

Presses.
La Salle Machine Works. Chicago, Ill.

Pipe Covering.
Sall Mountain Co., Chicago, Ill.

Punches.
Bertsch & Co., Cambridge City, Ind.
Interstate Machinery Co., Chicago, Ill.
La Salle Machine Works, Chicago, Ill.
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson & Son., Inc., Jos. T., Chgo, N. Y., St. L., Det., Cleve.

Punches—Combination Bench and Hand.
Hyro Mfg. Co., New York, N. Y.
Ryerson & Son, Inc., Jos. T., Chgo, N. Y., St. L., Det., Cleve.

Punches—Hand.
Hyro Mfg. Co., New York, N. Y.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Putty—Stove.
Connors Paint Mfg. Co., Wm., Troy, N. Y.

Radiator Cabinets.
The Hart & Cooley Mfg. Co., New Britain, Conn.
Tuttle & Bailey Mfg. Co., Chicago, Ill.

Radiators—Shields.
Beh & Co., Inc., New York, N. Y.
Hall-Neal Furnace Co., Indianapolis, Ind.

Register Shields.
Beh & Co., Inc., New York, N. Y.
Hall-Neal Furnace Co., Indianapolis, Ind.

Registers—Warm Air.
Auer Register Co., Cleveland, Ohio
Forest City-Walworth Run Foundries Co., Cleveland, Ohio
Hart & Cooley Co., New Britain, Conn.
Henry Furnace & Fdy. Co., Cleveland, Ohio
Independent Register & Mfg. Co., Cleveland, Ohio
Lamneck & Co., W. E., Columbus, Ohio
Meyer & Bro. Co., F., Peoria, Ill.
Milwaukee Corrugating Co., Mil., Ch'go. La Crosse, Kan. City
Tuttle & Bailey Mfg. Co., Chicago, Ill.

Registers—Wood.
American Wood Register Co., Plymouth, Ind.
Auer Register Co., Cleveland, Ohio
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Regulators—Heat.
National Regulator Co., Chicago, Ill.
H. M. Sheer Co., Chicago, Ill.

Ridging.
Armco Distributors Ass'n of America. Middletown, Ohio
Lupton's Sons Co., David, Philadelphia, Pa.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Rivets—Stove.
The Kirk-Latty Co., Cleveland, Ohio
Lamson & Sessions Co., Cleveland, Ohio
Ryerson & Son, Inc., Jos. T., Ch'go, N. Y., St. L., Det., Cleve.

Rods—Stove.
The Kirk-Latty Co., Cleveland, Ohio
Lamson & Sessions Co., Cleveland, Ohio

Rolls—Forming.
Bertsch & Co., Cambridge City, Ind.

Roofing Cement.
Connors Paint Mfg. Co., Wm., Troy, N. Y.

Roofing Tile—Clay and Shale.
B. Mifflin Hood Co., Daisy, Tenn.

Roof—Flashing.
Milwaukee Corrugating Co., Milwaukee, Wis.

Roofing—Iron and Steel.
Armco Distributors Ass'n of America, Middletown, Ohio
Central Alloy Steel Corp., Massillon, Ohio
Inland Steel Co., Chicago, Ill.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City
Osborn Co., The J. M. & L. A., Cleveland, Ohio
Ryerson & Sons, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Roofing—Tin.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City
Taylor Co., N. & G., Philadelphia, Pa.

Roofing—Zinc.
New Jersey Zinc Sales Co., The, New York, N. Y.

Rubbish Burners.
Hart & Cooley Co., New Britain, Conn.

Schools—Sheet Metal Pattern Drafting.
St. Louis Technical Institute, St. Louis, Mo.

Schools—Warm Air Heating.
St. Louis Technical Institute, St. Louis, Mo.

Screws—Hardened Metallic Drive.
Milwaukee Corrugating Co., Mil., Ch'go. La Crosse, Kan. City
Parker-Kalon Corp., 200 Varick St., New York

Screws—Hardened Self-Tapping, Sheet Metal.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City
Parker-Kalon Corp., 200 Varick St., New York

Screens—Perforated Metal.
Harrington & King Perforating Co., Chicago, Ill.

Shears—Hand and Power.
Interstate Machinery Co., Chicago, Ill.
Marshalltown Mfg. Co., Marshalltown, Iowa
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson & Son, Inc., Jos. T., Ch'go, N. Y., St. L., Det., Cleve.
Viking Shear Co., Erie, Pa.

Sheet Metal Screws—Hardened, Self-Tapping.
Parker-Kalon Corp., 200 Varick St., New York

Sheets—Black and Galvanized.
Armco Distributors Ass'n of America, Middletown, Ohio
Central Alloy Steel Corp., Massillon, Ohio
Inland Steel Co., Chicago, Ill.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City
Osborn Co., The J. M. & L. A., Cleveland, Ohio
Ryerson & Son, Inc., Jos. T., Ch'go, N. Y., St. L., Det., Cleve.
Taylor Co., N. & G., Philadelphia, Pa.

Sheets—Iron.
Armco Distributors Ass'n of America, Middletown, Ohio
Central Alloy Steel Corp., Massillon, Ohio
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Sheets—Tin.
Taylor Co., N. & G., Philadelphia, Pa.

Sheets—Zinc.
New Jersey Zinc Sales Co., The, New York, N. Y.

Shingles and Tiles—Metal.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Sifters—Ash.
Diener Mfg. Co., G. W., Chicago, Ill.

Sky Lights.
Lupton's Sons Co., David, Philadelphia, Pa.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Snips
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Solder.
Kester Solder Co., Chicago, Ill.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Soldering Furnaces.
Burgess Soldering Furnace Co., Columbus, Ohio
Diener Mfg. Co., G. W., Chicago, Ill.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Soldering Supplies.
Kester Solder Co., Chicago, Ill.

Specialties—Hardware.
Diener Mfg. Co., G. W., Chicago, Ill.

Stars—Hard Iron Cleaning.
Fanner Mfg. Co., Cleveland, Ohio

Statuary.
Friedley-Voshardt Co., Chicago, Ill.
Gerock Bros. Mfg. Co., St. Louis, Mo.
Miller & Doing, Inc., Brooklyn, N. Y.

Steel Pipe—Welded.
Chicago Metal Mfg. Co., Chicago, Ill.

Stove Pipe Reducers.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City

Tinplate.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City
Osborn Co., The J. M. & L. A., Cleveland, Ohio
Taylor Co., N. & G., Philadelphia, Pa.

Tools—Tinsmith's.
Bertsch & Co., Cambridge City, Ind.
Dries & Krump Mfg. Co., Chicago, Ill.
Hyro Mfg. Co., New York, N. Y.
Interstate Machinery Co., Chicago, Ill.
Maplewood Machinery Co., Chicago, Ill.
Osborn Co., The J. M. & L. A., Cleveland, Ohio
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.
Viking Shear Co., Erie, Pa.

Torches.
Burgess Soldering Furnace Co., Columbus, Ohio
Diener Mfg. Co., G. W., Chicago, Ill.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Trade Extension.
American Zinc Institute, New York, N. Y.
Copper & Brass Research Association, New York, N. Y.
Sheet Steel Trade Extension Committee, Pittsburgh, Pa.

Trimmings—Stove.
Fanner Mfg. Co., Cleveland, Ohio

Vacuum Cleaner—Furnace.
Brillion Furnace Co., Brillion, Wis.
Gottschalk Heating Co., Covington, Ky.
National Super Service Co., Toledo, Ohio

Ventilators.
Aeolus Dickinson Co., Chicago, Ill.
Akrat Ventilators, Inc., Chicago, Ill.
Arex Company, Chicago, Ill.
Berger Bros. Co., Philadelphia, Pa.
Folsom Metal Products Co., Chicago, Ill.
Friedley-Voshardt Co., Chicago, Ill.
Kernchen Co., Chicago, Ill.
Lupton's Sons Co., David, Phidadelphia, Pa.
Milwaukee Corrugating Co., Mil., Ch'go, La Crosse, Kan. City
Standard Ventilator Co., Lewisburg, Pa.

Ventilators—Ceiling.
Hart & Cooley Co., New Britain, Conn
Henry Furnace & Fdy. Co., Cleveland, Ohio

Windows—Steel.
Lupton's Sons Co., David, Philadelphia, Pa.

Zinc.
American Zinc Institute, New York, N. Y.
New Jersey Zinc Co., The, New York, N. Y.

WANTS AND SALES

Yearly subscribers to the AMERICAN ARTISAN may insert advertisements of not more than fifty words in our Want and Sales Columns WITHOUT CHARGE.

Such advertisements, however, must be limited to help or situation wanted, tools or equipment for sale, to exchange or to buy, business for sale or location desired and must reach our office by Thursday of the week of publication. This privilege is not extended to manufacturers or jobbers—or those making a business of buying and selling used machines—employment agencies and brokers.

When sending advertisement state whether your name or blind number is to be used.

BUSINESS CHANCES

Lightning Rods—Dealers who are selling Lightning Protection will make money by writing to us for our latest Factory to Dealer Prices. We employ no salesmen and save you all overhead charges. Our Pure Copper Cable and Fixtures are endorsed by the National Board of Fire Underwriters and hundreds of dealers. Write today for samples and prices. L. K. Diddle Company, Marshfield, Wis.

Wanted to Buy—Sheet metal shop in Chicago or vicinity. Must stand investigation. Give all necessary information. Will consider partnership in good going shop. Gentile. Address E-500, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

For Sale—Plumbing and heating supplies—new. Reduced prices. Write for list and prices. Address D-500, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

For Sale—On account of ill health, a good sheet metal shop in Chicago, situated in near north side, center business district. Established over 30 years. Will sell cheap. Address C-500, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

For Sale—On account of death, hardware store located at 504 Western Ave., Blue Island, Ill. Store phone B. I. 2261—Residence 1829. Address O-500, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

$350.00 cash and $15.00 a month will buy an $1,800 sheet metal business, including building and lot, in town of 2,000. Fully equipped to do all kinds of tin work and roofing. Address A-501, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

Wanted—Location for a first class sheet metal, furnace and plumbing shop. Prefer a town of 3,000 or less—in Iowa or Wisconsin. Address F-501, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

SITUATION WANTED

Position Wanted—Good sheet metal man and plumber wants good position. Married and can go to work at once. Will go anywhere. Address L. C. Hughes, Britt, Iowa. L-500

SITUATION WANTED

Man with twenty years of experience in all branches of sheet metal work, specializing in ventilation, desires position with firm where there is a future. Will gladly furnish references as to my ability and workmanship. Capable of taking charge of any sized job and completing same according to specifications. Prefer the larger class of work. At present employed, but wish to make a change. Address B-501, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

Furnace Fitting Superintendent—Thoroughly reliable, knows furnace fittings, efficiency in manufacturing, the keen competition. Can reduce your cost. Capable of building tools to short cut operations. I am looking for a live firm that can use a master in the game. Full information on request and can show results. Salary to depend on that. Address D-501, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

Position wanted in sheet metal shop by young man just finishing Industrial Educational course at University of Wisconsin. Retail shop preferred. Several summers' experience in tin shop and outside work and in hardware sales. Starting wages no object, provided advancement will be made according to merits of work. Address Chas. E. Pence, 28 East Gilman St., Madison, Wis. R-500

Attention, Heating and Ventilating Contractors—If you are looking for a man to take charge of your ventilating work, answer this ad. I am in a position to start at any time and any place. Do estimating, superintending and installing. Can furnish best of reference. Address W-500, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

Situation Wanted—By good tinner, hardware clerk, furnace installer, (Code System), hardware store and shop combined. Long experience and reasonable salary or percentage basis. Address H. J. Ester, 725 West Main Street, Washington, Missouri. C-501

SITUATION WANTED

Middle-aged sheet metal worker and furnace installer wants steady situation with reliable Hardware concern in Minnesota or Iowa county seat town. Will work on percentage or profit-sharing basis of desired. Address S-500, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

Young Man—25 years of age with 6 years of experience in furnace installation and some sales, seeks position. Fitted to superintend installations, good at plan and layout. I can give plenty of good reference and furnish bond. Address E-501, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

Position wanted as shop manager or factory superintendent by sheet metal man with 28 years of experience. Six years managing own shop. Skilled in all branches of the trade in handling men and laying out of work. Address H-500, AMERICAN ARTISAN, 138 N. Clark St., Chicago, Ill.

Situation wanted by first-class sheet metal worker and furnace man. Can cut all patterns, lay out work and handle men. 28 years' experience, married and sober. State full particulars in first letter. Address Tinner, 502 Oakwood St., Owosso, Mich. T-500

Position wanted by first class plumber and sheet metal worker in New York state or northern Pennsylvania. Married, steady and sober. Will only consider year around work. Address K-500, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

A-1 licensed plumber, tinner and heating man wants position or will take good shop on commission. Address J-500, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

HELP WANTED

Retail Hardware dealer wants to make connection with a real, live, young, competent, modern, selling, window display, show card and interior arranging young man at once. State wages and give reference in first letter. Address R. B. Fitzgerald Hardware Company, Madison, S. D. X-500

Wanted—First class sheet metal man. One who understands job work, can read blue prints and work from same. Steady work the year around for the right man. We also want an A-1 radiator repair man. Steady year around work. Address J. H. Barnett, Dodge City, Kansas. 312 West Front St. G-500

Wanted—Plumber; one who can do some galvanized iron work preferred. State wages. Wire at my expense. Address S. W. Laceby, Mackinac Island, Mich. Y-500

MISCELLANEOUS

For Sale—One Delco lighting plant. Address Edward Lloyd, Route 2, Whitewater, Wisconsin.

TINNERS' TOOLS

Having recently purchased complete set of tinners tools from the Highland Sheet Metal Works of Denver, we offer them for sale at our warehouse. List of tools and prices furnished upon request. Address C. A. McFarland, 1448 Blake Street, Denver, Colo. F-500

Wanted to Buy—10 ft. Chicago or Robinson brake. Must be in A-1 condition. Give your best price for cash in first letter. Address Balding's Sheet Metal Works, 551 South Elm Avenue, Kankakee, Illinois. G-501

TINNERS' TOOLS

Wanted—Corrugated curving rolls, handle, 18 gage metal, in good condition and cheap. Address Sam H. Kerr, Lufkin, Texas. M–500

For sale—2" Williams Pipe Cutting Machine with motor drive for plumber's work. Has not been used over fifteen days, is in excellent condition and will be sold very reasonable. Address Lock Box 552, Kane, Pa. Z–500

SPECIAL NOTICES

The Rate for Special Notices — displayed want ads — $3.00 per inch per insertion
When sending copy state whether your name or blind number is to be used—also how many insertions are desired.

SHEET METAL MANUFACTURER

Small town central Ohio, wants middle aged sheet metal operator, who can read blue prints. Lay out work, keep shop records and direct 50 or more men. Address H501 AMERICAN ARTISAN, 139 N. Clark St., Chicago, Illinois.

WANTED

Furnace jobber in Minnesota. We will furnish a complete stock on consignment, handle the account and circularize the furnace trade. A good proposition for a good live dealer. Address J501 AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

SALESMAN WANTED

Wanted a good live young furnace salesman to travel Minnesota territory. Address K501, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

BOOKS

Manual of Automotive Radiator Construction and Repair, by F. L. Curfman and T. H. Leet—Anyone interested in Radiator Repairing will find the 185 pages of practical instructions and the 120 illustrations showing actual construction and repairing a big help. In a condensed manner some four to five thousand answers to questions are given. It is thoroughly practical as both authors are men of wide experience in this work. Printed in large, easy to read type. Measures 5¾x9 inches. Price $2.50. Order from book Dept., AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

The Revised Edition of the New Metal Worker Pattern Book by Kittredge and Associates is one book that should be in every shop. As a reference book alone it is indispensible. Over 500 9x11-inch pages with 895 illustrations. It covers the principles underlying practically every problem that is likely to come up in daily practice. Beginning with the selection and use of drawing tools, the author explains linear and geometrical drawing so clearly that one who has had no previous knowledge of arithmetic or drawing may understand these essentials and apply them. The most approved methods of pattern cutting are also given in the course of the work. Price, $6.00, postpaid. Order from the Book Dept., AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

BOOKS

Exhaust and Blow Piping, by Hayes—Exhaust and Blow Piping has had an unusually big demand. A fresh supply is now off the press and is in our hands for immediate delivery. It has an invaluable treatise on the planning, cost, estimation and installation of fan piping in all its branches giving all necessary guidance in fan work blower and separator construction. 159 pages, 5x8. 51 figures. Cloth. $2.00. Order from Book Dept., AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

Here are the two books that most sheet metal workers and contractors classify as the most complete books on Sheet Metal Pattern Cutting. The Universal Sheet Metal Pattern Cutter, Vol. 1, deals with every phase of inside work, including Heating, Ventilating, Blower and Exhaust Piping Connections, Marine Sheet Metal Work, Automobile Sheet Metal Work, Machinery and Belt Guards, etc. Mensuration applied to Sheet Metal Work, etc., with many features of construction and Labor Saving Methods are also given in detail.

Vol. 2 deals with every form of Outside and Architectural Sheet Metal Work. A treatise on Drawing, Full Size Detailing and Lettering, Construction of Cornices, Skylights, Molding, Copings, Electrically Illuminated Signs, etc.

Cloth bound, 400 pages each volume. Price, $7.50 per volume, postpaid. Order from Book Dept., AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

The Standard Code Computing Rule, which is adapted from Article III of the 5th Edition of the Standard Code, is being used by warm air heating men all over the country. Here is what the Computing Rule will determine: (1) The warm air pipe and register areas for first, second and third floor rooms. (2) The areas necessary for 70° inside temperature when the outside temperatures are zero, 10, 20 and 30 degrees above or below zero. (3) The areas from the contents, glass, wall, roof and ceiling. The factors as covered in Table "A" are represented in accurate form. (4) The areas for rooms having one, one and one-half and two air changes per hour. (5) The unusual exposure requirements as the 10% for east and west and 15% for northeast, north and northwest rooms. Rule is circular, measuring 5½ inches in diameter and ⅛ inch thick, being made of specially prepared celluloid. Washable and unbreakable.

Price, $3.00, postpaid, from Book Dept., AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

SOLVE ROOFING PROBLEMS *with this Quality Equipment by* Eller

Top: Eller's Improved Slip-Joint Eave Trough and Inner Corner Mitre.

Left and Right: Round Corrugated, Plain Round and Corrugated Square Conductor Pipe and Elbows.

Below: Eller's Non-Syphoning "Kant-Leak" Corrugated Roofing.

ELLER-MADE roofing and rain-carrying equipment are quality products throughout . . and fully guaranteed.

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